JOURNAL

OF THE

MICHIGAN SCHOOLMASTERS' CLUB

FORTY-THIRD MEETING
Held in Ann Arbor, April 1, 2, 3, 4, 1908

ANN ARBOR, MICHIGAN
PUBLISHED BY THE CLUB

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In 1904 the position of Secretary was made permanent, and in 1906 it was also made a salaried one.

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Michigan Schoolmasters' Club

PROCEEDINGS OF THE FORTY-THIRD MEETING HELD AT ANN ARBOR, APRIL 1, 2, 3, 4, 1908

EDITED BY THE SECRETARY

GENERAL MEETINGS

The forty-third meeting of the Michigan Schoolmasters' Club began on Wednesday, April 1, with meetings of the classical and modern language conferences, and the conference of physics and chemistry. At half after two o'clock the third symposium on the Value of Humanistic, and particularly Classical, Studies as a Preparation for the Study of the Professions was given and reprints of it will be sent to all members of the club. At eight o'clock Professor Charles Knapp of Columbia University gave a lecture on "The Roman Theatre."

The general meetings were held on Thursday morning in University Hall and on Friday morning in High School Hall. Thursday morning the topic for discussion was: Formal Discipline in the Light of Modern Psychology. Professor James R. Angell of the University of Chicago spoke upon "The Bearing of General Psychological Principles upon the Doctrine of Formal Discipline," Professor W. B. Pillsbury of the University of Michigan upon the "Effects of General Training Upon Memory," and Professor Charles H. Judd of Yale University upon "Training in Special Subjects as Related to General Intelligence and Capacity." Reprints of these three addresses or papers will be sent to all members of the club under a separate cover.

On Thursday at 5 o'clock a musical program was given by members of the Faculty of the School of Music, and at 8 o'clock an address was given by Professor George Lincoln Burr of Cornell University on "History and Geography." After the address a short reception was held.

The Friday morning Session was given over to the teachers of history

and proved to be of interest to all concerned. Papers were read by Miss Mary Hinsdale of Detroit, Principal C. L. Spain of the Detroit Normal Training School, and by Professor J. A. James of Northwestern University.

Friday evening Professor Maurice Hutton, of the University of Toronto, gave an address on "Wit and Wisdom of Heroditus." The address was witty and full of wisdom.

Further information concerning the meeting will be found in the last part of the Journal.

The influence of the club extends to many parts of the world. The cities of London, Paris, Berlin, Leipzig, Moscow, Vienna, and the cities of Canada and of South America have eagerly sought our proceedings. The University of Vienna has, with permission, translated and printed some of the proceedings, and Austria is to have, or has had by this time, a large convention for the purpose of starting work along lines laid out by our club.

Nearly one thousand copies of the Journal and 6,500 reprints have been distributed to members and to every library of importance in the United States and in many foreign countries—Surely the Schoolmasters' Club is doing a fine work in matters educational.

REPORTED BY MISS MARY GOLD, OF FLINT, SECRETARY.

Two of the general sessions of the Schoolmasters' Club were devoted this year to historical subjects:—Thursday evening, when Professor George L. Burr, of Cornell University, gave an address on "History and Geography"*; and Friday morning, when three papers were given on the subject, "History in the Schools." The first was by Miss Mary Hinsdale, Detroit Central High School, on "The History Problem from the Point of View of the Public High School"; the second, "History from the Point of View of the Elementary School," by Mr. Charles L. Spain, Detroit Normal Training School; and last, Professor J. A. James, of Northwestern University, gave an address on "The Principal Findings of the American Historical Association's Committee of Eight on History in the Elementary Schools."

The special history conference convened Friday afternoon at two o'clock. The session opened with a paper by Mr. Frank Bacon, of the

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* NOTE OF PROFFESSOR BURR'S LECTURE: Professor George Lincoln Burr, of the department of history in Cornell University, gave a very interesting lecture at the Thursday evening session of the Club, on "Geography and History." Teachers desiring a copy of this lecture should write to W. H. Cushing, Framingham, Mass., secretary of the New England History Teachers' Association, since it is printed in a *Report* of that association.

University of Michigan, on "Experience with Collateral Reading." Both he and Miss Hempstead, of the Detroit Western High School, who led the discussion following, made a noble plea for a few definite assignments and reports on the same, showing that the pupil had actually done the work; scoffing at a pretentious list of references in history and fiction which might please the eye on the pages of a note-book, but would hopelessly swamp the student's ambition before he had even made a beginning.

Professor Dana C. Munro, of the University of Wisconsin, followed. His topic, "Where Should the Emphasis Fall?" was a polite but earnest appeal to his hearers to demand accuracy of statement from their pupils at almost any sacrifice, so that the first six weeks of their college course need not be spent in learning how to express plain facts. It is safe to say that no teacher of a secondary school who listened to this excellent talk went away with the feeling that inexact statements, no matter how beautifully trimmed with entertaining details, would pass muster in the future. Mr. Munro also deplored the amount of time spent on events of ancient history at the expense of neglecting those of modern times, showing clearly that more can be gained by pursuing the career of Bismarck than that of Solon.

Mr. C. S. Larzelere, of Mount Pleasant, in a spirited talk of only a few moments emphasized six points to be brought out in every lesson, namely: 1. The Actors. 2. What they did. 3. The Time. 4. The Place. 5. The causes which acted. 6. The results.

Mr. C. E. White, also of Mount Pleasant, followed and spoke not of methods, but experience in high school work in modern history He told of the difficulty his own pupils had had in understanding the real meaning of certain periods in history, even when they could recite well on almost any lesson assigned; so he worked out a scheme by which less time is spent on minor details and more emphasis is laid on large movements like the Renaissance and the Reformation, bringing out the idea that there are always two opposing parties—the conservatives and the liberals—in every great movement.

The formal part of the program closed with a suggestive paper by Miss Helen Johnson, of Muskegon, on "Unifying Elements in English and American History." She showed very clearly that no matter from what point of view,—political, religious, or social,—a movement may be treated, the correlation exists; we having a common ancestry, language, and government; and each in the acquisition of territory having been the protector of a down-trodden people.

Miss Johnson's paper was followed by an uninteresting discussion on what changes should be made in the report of the committee of seven. This is too important a matter to be placed at the close of a day's session when people are tired and hurrying away to catch trains; but on the whole the history conference was one of great merit and will long be a benefit to those who were fortunate enough to attend.

HISTORY FROM THE POINT OF VIEW OF THE ELEMENTARY SCHOOL.

PRIN. CHARLES L. SPAIN, DETROIT, MICH.

To the casual observer, perhaps indeed to the student of education himself, the curriculum of the elementary school suggests a state of chaos. Enthusiasts *have* done and are doing many unpardonable things in the name of the new education. In some quarters, guided by a false conception of the doctrine of interest, courses of study have been formulated which, based upon a soft pedagogy, lead the child along the line of least resistance. In other quarters, with a singular lack of regard for child nature, pedagogs have adhered to obsolete, logical courses of study, which they laboriously attempt to force upon immature and undeveloped minds. Failure has been inevitable in both instances.

Today careful students of elementary education are following a middle course and as an outcome of their efforts, a curriculum is gradually being evolved which on the side of psychology consults the needs, powers and interests of the child, rather than the demands of formal discipline, and on the side of society is based upon a rational understanding of the requirements of personal and social efficiency. In this new curriculum, which, we have reason to feel, is pedagogically more sound than its predecessors, the subject of history is a very important factor.

In any rational discussion of the educational value of a subject one is confronted at the outset by the old, but ever pertinent, question, "Why teach the subject at all?" To this question the schoolmen of the higher institutions would probably answer, "History should be taught as an end in itself; for its own sake." To this we would be inclined to reply that, while such an ideal may suffice for the select few who are able to pursue their studies into the higher realms of investigation, it is too remote for the elementary school in which the aim must bear a more immediate relation to the personal and social needs of the children.

To the lay mind the purpose of history teaching is to give the child historical information and to nourish in him a patriotic spirit. This ideal would doubtless serve also for a great many teachers. All of these ideals are perhaps valid enough, but to the teacher who seeks to make history a living, dynamic subject, which shall signify something in the lives of her children, they are far from satisfying.

The purpose of the modern elementary course in history is to contribute directly to a child's personal and social efficiency, not by storing in his mind information (more or less beyond his comprehension) against the day when he may need it, but by presenting to him at each stage of his development the historical matter which shall identify him with his present environment

in knowledge, in interest and in activity. The watchword is to admit no historical material into the elementary course save that which vitally touches a child's life. This does not mean that a child shall be expected to comprehend the full import of every fact at the time that fact is presented. It does mean, however, that no subject matter shall be introduced into the course purely on the ground that it will satisfy a future need and that in every lesson there shall be a vital point of contact between the facts presented and the pupil's present interests and experiences. While the history which we teach him must function with his present experience and interests it should not only serve his immediate needs but point the way toward a better social adjustment in the future.

Social needs offer a most powerful motive for study and investigation. The elementary school can and must lay hold upon this motive. Historical knowledge presented to a child which does not function with the present is a thing apart; it lacks reality and does not and cannot affect his conduct. But if from the vast field of historical facts we bring to a child just those ideas which interpret and make more significant his present experience, we give historical knowledge the validity and force of information which comes to him directly through contact with the world.

History is in a true sense not a study of the past but a study of the present in the light of the past. Cut it off from the present and it is a dead, lifeless thing. Seek the motive for history study in the present needs of the children and this study at once becomes a living, pulsating force not less effective in the child's life than the direct influences of his present environment.

Life alone can enable one to form a clear conception of history. A child in his early years is individualistic. His experience is meagre and circumscribed. It is only gradually that he emerges from an individualistic state and becomes conscious of his relation to the social unit. In as much as his conception of history at any given time is based upon his experience up to that time, it is important not only that his experiences be rich and full but that in the selection of historical data for his consideration we choose from the field of race experiences those events and instances which shall bear most directly upon his study of contemporary social life.

The proponent of the new course in history has had little opposition in working out his theories in the primary grades, for history has not until recently been considered an essential subject in grades below the seventh. If we use the term history in a broad but nevertheless an entirely permissible sense, we shall find that in the early grades we are unable to differentiate history proper from literature, and social and industrial studies with their related motor activities. "Story and history are but earlier and later forms of tradition." The history of every nation has its beginning in the hazy realm of myth and legend. Pedagogically we can no more draw a line of demarcation between tradition and true history than we can separate sharply the periods of a child's mental development.

Viewed in another light history is a social study and a child begins to experience history as soon as he becomes a participant in the activities of the social world. All of his studies of social and industrial life which tend to free him from his egoism and extend his horizon of social experiences are essentially a part of his history study. Nor is it possible to separate history from the manual activities now taught in the primary grades. By means of these simple industrial processes children come to participate in race experience no less truly than in the study of biography and institutional life.

In the early years the course is rich in myth, legend and fairy tale because at this time the child revels in imagery. His studies of the simple social activities of his home, school and neighborhood are supplemented by parallel studies of the lives of primitive people—the Indians, Eskimos and Ancient Shepherds. A consideration of these simple direct forms of life tends to make clear to him the ordinary social relationships, which in the complex life about him are often confused and unintelligible.

As a child advances through the grades his taste for the fanciful becomes progressively less and the real begins to occupy a larger place in his consciousness. The most striking trait in the child of the middle and early grammar grades is his interest in the individual—the personal. He himself is still to a large degree individualistic and events affecting nations and large groups have little interest for him. He is touched by the story of John Alden and Miles Standish, but he cares far less for the history of the Plymouth Colony as a whole.

This interest in the personal takes the form of hero-worship and the hero who has displayed physical prowess is usually preferred to the hero whose achievements lie in the field of the intellectual or moral. In his biographical studies the more strikingly dramatic the events are, the greater his interest and enthusiasm. George Washington's long journey through the wilderness on his mission from Gov. Dinwiddie appeals more strongly to a child than anything Washington did either as soldier or statesman.

If we bear in mind these traits of child nature and assume that in the study of biography (as in all other aspects of our history study) the present needs of the pupils shall set the standard for selection, we may draw our material from the whole range of human experience. The heroic qualities which appeal to a child are universal, so it matters not whether we select our heroes from the Hebrew stories of the days of the Patriarchs, from the myths and legends of Greece, Rome and the North, or from the legends of Roland, Arthur or Robin Hood. For real heroes we may choose from the whole range of America's heroic men from the days of Columbus to the present; from the group of men whose exploits lie close to the development of our own state, La Salle, Marquette, Cadillac and Perry; or from the long line of English and French heroes, the dramatic events of whose lives may be welded into stories of intense interest.

In applying these principles to the course in history for primary grades we find little difficulty because we are treading upon hitherto unoccupied ground, but if we seek to make application of the same principles to the seventh and eighth grades we encounter immediate opposition. Tradition has decreed that before the child leaves the grammar grades he must in his studies run the whole gamut of American History, from Columbus to the close of the period of the Civil War. In few public schools is this traditional course departed from.

To any suggestion of proposed revision there are those who rise to urge that in as much as a majority of children leave at the close of the eighth grade, considerations of patriotism demand that they shall know the history of their own country before they depart. And furthermore the high school, as the requirements are now adjusted, demands the completion of a full course in American History previous to entrance.

Be this as it may, there are many who feel that the history course for the upper grammar grades as now arranged and taught is open to serious criticism. Viewed in the light of modern psychology and child study, it is unscientific, although the topics as arranged present a logical as well as a chronological course of study. It is a clear example of the attempt so frequently made to intrude adult standards into the affairs of childhood. From the child's standpoint such a course of study is radically wrong because on the side of the individual it disregards a child's powers and interests and on the side of society it takes no heed of his present experiences and needs. It lays too little stress upon the biographical, social and industrial phases of the subject which lie within range of the pupil's interest and grasp and too much emphasis upon the politcal aspects of the subject which have little real significance for grammar grade children.

One hesitates to place any general strictures upon methods of teaching, for any criticism which holds in general is likely to be unjust in many specific instances. However, it is fair to say that the very nature of the course itself makes for formal, mechanical teaching. The teacher has a long list of topics outlined in her text-book. These the children must know preliminary to the final test. Hence she must hurry them over the whole course. Deny it as we may, a great many teachers are still teaching facts as facts and the possible outcome of the final examination still casts a shadow on the term's work.

There are on the other hand many good teachers whose work is never commonplace or mechanical, who affect a philosophical method of teaching which would be excellently adapted to students of a higher institution but cannot be justified in the lower grades. A child very early begins to note the relations between cause and effect, but this power does not become critical until early adolescence. In the grammar grades we can and should appeal to a pupil's power of inference. He is now interested in motives and can readily note causal relations provided the data with which he deals touches his present and past experience and does not transcend the

range of his comprehension. But when he is called upon to deal with such questions as the Development of Political Parties, the Growth of a Tariff System and the Evolution of the Doctrines of State and National Sovereignty his powers of inference are totally inadequate.

Again our teaching often falls short because while we do appeal to a child's power of inference and to his memory, we fail to touch his imagination and emotions. The results of our efforts are often disappointing because the pupils acquire the form without the substance. They not infrequently leave the grades with a modicum of unassimilated verbal knowledge unrelated to their lives. They have little interest in or enthusiasm for history because they have realized it as an isolated subject having no essential relation to their experience. Their knowledge does not give them joy and they are seldom able to apply this knowledge in other fields of activity.

It is manifestly unfair to be destructively critical without offering at least some compensation in the way of positive suggestion. As has been indicated, the fault in the course lies in the attempt to preserve the logical and chronological continuity of the subject matter. While biography appears less prominently in the upper than in the lower grades, it still has an important place. There are heroes of exploration, discovery and settlement, about whose lives many historical events of the early days of our country may be grouped. In the lower grades when the child is individualistic, his interest centers in the personal exploits of his heroes; in the later years of the course as the interest in group life appears, his attention turns more directly toward those aspects of the hero's life which indicate a relationship to some social group.

The period of settlement and the colonial period are rich in events which appeal to a child. The beginnings of social, industrial, and political life were free from complexity. The wars were full of dramatic incidents and if we wish to emphasize the social and industrial life of the colonial period, we shall find topics in abundance which are entirely suited to the children of the grammar grades.

Many events occurring after 1787 should be deferred to the secondary course. The political development under the Constitution is too complex and too far removed from a child's experience to have much significance for him. There certainly is serious reason to doubt whether such topics as the Monroe Doctrine, Nullification, State and National Sovereignty, the National Bank and the Development of the Protective Tariff System are at all suited to the minds of grammar grade children. Certain it is that a child who has studied these questions carries away little more than a few generalities, which, if they mean anything to him at all, convey nothing more than half truths.

The topics selected from this later period should bear strongly upon the evolution in social, industrial and educational affairs rather than upon political or constitutional development.

It would seem that the principle of the type method which has been so successfully applied in organizing material for the geography course might be equally effective in selecting topics for our study of history. There appears to be no reason why we cannot choose from the field of suitable material a number of topics which, while typifying certain kinds of life and certain phases of development, shall act as integrating centers for much other useful knowledge. If instead of trying to take a hurried, superficial survey of the whole subject, the pupil could concentrate his efforts upon an intensive study of a few typical fields, the outcome of our teaching would probably be more satisfactory than it is now.

Secondary teachers have long complained, and I believe justly, that pupils come to them with little knowledge of the physiographic setting of American history. As long as the course covers such a wide range this phase of the subject will probably receive little attention. If, however, the pupil could devote his efforts to an intensive study of a few important units, he would have ample time and opportunity to form a clear picture of the theatre in which the events took place and there would be less cause for complaint regarding the deficiency of his physiographic knowledge.

While chronology should not *dominate* the choice of topics the events selected for study should assume their proper sequence and pupils should make use of a chronological chart and such other devices as will assist them to keep their knowledge in proper relation.

If the teacher of history would realize the real possibilities of the subject she must bring to the minds of her pupils a series of vivid, animated pictures of the life of the past. Events must be brought home to the child's experience. He must see these events not as a spectator but as a participant. There is an epic side to our history which must not be overlooked. American Literature abounds in stirring, dramatic stories which reflect the various phases of our colonial and national life. The historical novel, if used discriminately may be a most helpful adjunct to the work in history. Contemporary documents—letters, speeches, newspaper articles —if chosen with discretion will tend to give events a correct historical setting. Teachers should if possible use pictures, the stereograph, the stereopticon and every legitimate aid to the end that her teaching may be real and throbbing with life.

It may occur to some that the knowledge to be acquired from the course here suggested would be too piecemeal and unrelated to be of value. To this objection it may be replied that what information the pupil does receive will have a real meaning in his life, will sink below the level of memory and will be a positive force in directing his conduct. So much cannot usually be affirmed of the results we now obtain. It must be remembered too that the end of teaching is not information merely and that if we do not awaken the higher powers of mind we in large measure fail.

So much for the impression side of history teaching. Granting that

the course as outlined leaves nothing to be desired and that events have been brought home vividly to the pupils' minds by effective teaching, it still remains for us to provide appropriate opportunities for reaction. Passing over the more familiar modes of expression let us pause for a moment to consider a form of reaction not in general use in connection with the teaching of history in the public schools, but which nevertheless has a legitimate place in elementary school work—namely dramatization.

Two traits of child nature have an important significance when considered in connection with dramatic expression. First, children have an intense interest in the dramatic—in people in action. Second, every child is instinctively a mimic—a born actor. Dramatic imitation then becomes as natural to a child as any other instinctive act. Among primitive people this form of expression was commonly used. When in the long winter evenings the family was gathered about the camp-fire, the hardy warriors would tell and retell the familiar tales of Indian lore—tales of the chase, of the dance and of the fierce conflict, and when in the course of the narrative the warrior touched upon the scenes which were intensely dramatic, the little Indians would rise spontaneously and with the keenest pleasure reproduce the scenes of the hunt, the dance and the battle. Thus the youthful redmen came to know and to appreciate the mythical lore of their race through dramatic participation in the scenes as they were described by their elders. Who can doubt that their imaginations were stimulated and their emotions aroused more deeply than they could possibly have been had they passively listened to these tales.

Dramatization, the realization of one's ideas in a motor way, is effective beyond all forms of expression in developing the constructive imagination. When a child loses his identity in the character of Robin Hood, Miles Standish or Columbus; when he has entered into the world of imagination so completely as for a time to lose account of reality, there comes to him an emotional experience which means the expansion of his personality.

In the most advanced schools throughout this country dramatic impersonation has become as firmly established as a mode of expression as writing or speaking. It is unquestionably founded upon correct principles. As a primary school exercise it is legitimate, practical and adapted to child nature and as years go by we are likely to make greater use of it in the public elementary schools.

In conclusion I appeal,

First, for a course in history for the first eight grades, based not upon the unity and logical development of the subject, but upon the known phenomena of child nature and the child's present rather than his future social needs.

Second, for a grammar grade course which shall focus the pupil's attention and effort upon a few typical centers of interest rather than compel him to attempt to cover the whole field.

Third, for a method of teaching which while not neglecting to teach facts shall touch the imagination and emotions of the children and make their study of history a stimulating, inspiring experience.

If a child should leave the grammar grades with a fairly clear conception of the lives and deeds of *some* of the great characters of history; with a vivid picture of a *few* of the more dramatic events and of the *theater* in which those events took place; with a *love* and *enthusiasm* for history and a *desire* to pursue the study further, he would be infinitely better prepared to take up the higher courses, than he is now with his superficial, unassimilated verbal knowledge of the whole field of American history.

HISTORICAL CONFERENCE.

WHAT SHOULD TEACHERS OF HISTORY IN THE SECONDARY SCHOOLS TRY MOST TO DO?

PROFESSOR D. C. MUNRO, UNIVERSITY OF WISCONSIN.

In history courses in secondary schools the teacher should set before himself two ideals. First, to teach pupils a number of the most important facts, so that they may have a body of useful information; second, to train them in historical-mindedness, thus preparing them for citizenship. As the "Committee of Seven" so well says, "Progress comes by making additions to the past or by its silent modification. All our institutions, our habits of thought and modes of action, are inheritances from preceding ages: no conscious advance, no worthy reform, can be secured without both a knowledge of the present and an appreciation of how forces have worked in the social and political organization of former times." If our legislators had learned this at school, we should have had less wild-cat legislation in the past. It is our duty to educate the future law-makers of the nation. The teacher's aim should be to have the student acquire such a body of information about the world in which he lives that he may be able to understand the factors which influence present-day conditions. He should also be taught to consider cause and effect, to weigh the arguments on both sides of a question dispassionately, and to decide without prejudice what seems the more experient.

These two purposes should determine the teaching of history. The latter is the more important. The Report of the "Committee of Seven"

is entirely correct in saying, "Power of gathering information is important . . . but the power of using information is of greater importance." Very true, but the information must be gathered before it can be used. Consequently, the first task should not be neglected. The majority of high school students do not obtain any more formal education. If the boy does not acquire the necessary knowledge in the high school, too frequently he will never obtain it.

In order to accomplish these purposes, the selection of material must first be considered, and secondly, the proportion of time to be given to each division into which the subject matter falls.

In selecting the material which the student must acquire, the emphasis should be placed on the subjects which will best accomplish the twofold purpose of the cultivation of historical-mindedness and of preparation for the present. This is a truism; but it needs repetition because it is neglected in practice, and it conditions all our work. In studying the history of any period or of any nation, there are two fundamental considerations. First, what are the distinguishing factors in its civilization, and second, what has been its influence on modern times? Many of the details in Ancient, Greek, Roman, and Medieval history, however interesting they may be in themselves, should be omitted as impertinent. But the related facts which illustrate the civilization and bring out our indebtedness to these former ages, should be carefully gathered and taught. "History has to do with life, with the thoughts, aspirations and struggles of men." Consequently the life of the period should be kept constantly in the foreground. History should be made real by the study of the careers of great individuals on the one hand, and on the other by the portrayal of the life which the average man lived. The geographical condition should be emphasized, and man's gradual conquest and control of these geographical conditions. The influence of the Nile on the history of Egypt should be dwelt upon, but the emphasis should be placed on the manner in which what otherwise would have been a curse was made by human activity into a blessing. The germ-producing conditions of Lower Babylonia and the consequent development of medical knowledge and magic are important facts, because they help to explain the spread of the knowledge of Babylonian science and magic in later times.

Moreover, in these more remote fields of history there is an unusual opportunity to inculcate historical-mindedness. The pupil can study dispassionately the career of Caesar and of Cicero and realize that each one was working for a justifiable cause. He may be led to realize that if he had lived in the first century, A. D., he would probably have been among the persecutors and not among the Christians. A few such studies, a few debates, are very useful.

These illustrations may suggest the principle of selection for the facts on which the emphasis should be laid. The questions which should always be present in the teacher's mind are: What is it in each civilization which

has been most important for the general history of the world, how did it come about, and how has it influenced present-day conditions? Sometimes the stress will fall upon philosophy, science, literature and art, as in Greece; at other times, on political and legal institutions, as in Rome; on the progress of discovery, as in the 15th century; in short, on whatever in each period is most important for the double purpose. It will fall more frequently, in the past, on economic and social conditions than on military and dynastic struggles, but the latter cannot always be neglected. It is, however, a very poor method to bring in for each period a little geography, a few facts in political history, a short statement of constitutional changes, a word or two about each one of the great men, and a brief sketch of "Life, letters and art." The teacher must get away from this choppy presentation, and deal with the really important issues, giving to each its logical proportion of time.

This suggests the second main heading: Proportion of space or time for the various divisions of history. The Report of the "Committee of Seven" is framed with the hope of having four years of history in the high school, and consequently proposes four blocks of history. If less time is to be devoted to the subject, it recommends omitting a whole block rather than shortening any one. Unfortunately in many of the schools, three years is the time normally allowed at present for the study of history. The programme most frequently, at least in the schools which I know, is one year of ancient history, one-half year of medieval history, one-half year of modern or of English history, one year of United States history, or else one-half year of United States history and one half year of civics. Not infrequently the latter plan is adopted and only a half year is given to United States history, while in the preceding year medieval and English history are taught. In that case all of the modern European history which the student obtains in his course is the slight information which he gathers in the small amount of time devoted to the later portion of English history. This practice seems to me very bad. Our main interest is in present-day conditions. Modern history is relatively the most important. In a three-year course at present, under favorable conditions, modern history receives one-third as much time as ancient and medieval combined. I believe that it should have at least as much time as the other two. The results which are produced by the present conditions may be illustrated by examples from the text books now in use. Solon receives more space than Bismarck. This is true in practically all the histories. In one of the best text-books on modern history, Gladstone, Darwin and other leading men of the 19th century are not mentioned, but Robert Bruce receives some attention. The history of India down to 1763 is related, but the later history is not touched. Surely, it is unfortunate to leave the student with the impression that the Indian history since 1763 is unimportant in comparison with the history before that date. If we compare the treatment of medieval and of modern history, re-

spectively, we find that John Milton receives less than three lines, and Anselm half a page; Shakespeare about four lines, and Irnerius six lines; Roger Bacon has a page and a quarter, Darwin is not mentioned; the Golden Bull is discussed, but factory legislation is omitted; chivalry is described at length, but there is only a slight reference to socialism; the minnesingers are considered worthy of a place in history, but not the nihilists. Dozens of other striking illustrations can be culled in going over any one of the better text-books.

These illustrations suggest one of the main difficulties. The text-books are tools which are relatively excellent but not entirely adapted for high school work. The improvement in text-books in the last few years has been very great indeed. In every field there are at present several good books, in fact, much better books than any in the past. But in almost every case, as the text-book approaches the present day and the immediate interests of the student, it becomes more and more meager and dull.

What can be done about it? If we have only three years for history, I think that one year should be given to ancient and medieval, one year to modern and of this at least one-half to the 19th century, and one year to United States history. The objection occurs at once that in one year devoted to ancient and medieval history, we are returning, to some extent, to the old fashioned course in general history. We all deprecate this. The "Committee of Seven" advised strongly against a one-year course in general history and then recommended a two-year course in general history. It is important that our students should have a general out- a longer period for the earlier portions, but the question is: what is most important for the student, and it seems to me the answer must be: the history of the more modern period. If there are four years of history in the high school, it seems advisable to give one and a half years to ancient and medieval, as at present, and one and a half years to modern history. English history should be included in the general medieval and modern. Until the end of the Hundred Years' War there is no logical reason, in a general course, for separating the history of England from the history of Western Europe. Since that time, English history is, to a certain extent, more isolated but we have made altogether too much of the isolation caused by the English Channel. In the study of history this has been a much more effective barrier than it has been in any other line of thought. Conditions in England have been profoundly influenced by the conditions on the continent and *vice versa*. English history should be included as a very important part of the general history of Western Europe. English institutions should be especially emphasized because of their influence on our own history. In studying feudalism the Norman-English type should receive emphasis, and the feudalism of the rest of France should be subordinated. Local government in the English town and manor should be described. The rise and influence of parliamentary institutions are more important for

our purpose than the Imperial constitution or the absolute monarchy, and should receive a larger proportion of attention.

The two greatest needs in text-books are, first, an ancient history suitable for a half-year course in the high school. This would necessitate leaving out the details of the Peloponnesian War and of the earlier history of Rome, and most of the military history which occupies so large a part of the present text-books. It would compel both the text-book maker and the teacher to concentrate their attention on the really significant periods and facts in classical history. Something would be sacrificed; but when anyone has attempted to construct a course in Roman history, for instance, and has realized how small a proportion of the valuable material can be put into a half-year, it is apparent at once that a reduction by a slightly larger percentage will not greatly affect the result. The second need is a text-book in which English history shall be completely fused with the general modern history. Medieval English history is so treated at the present time in most of the recent text-books. Occasionally English history down to the 18th century is deemed important for inclusion in a general sketch. At least one text-book does include modern English history. This points the way to what every text-book on modern history should include. Text-book makers follow closely the desires of teachers, even to such an illogical degree as beginning the history of the Middle Ages at 800 A. D.

The Report of the "Committee of Seven" has performed a great service. There is today a large body of well-trained, enthusiastic teachers of history. In getting away, however, from the "unencumbered text-book method" the emphasis is too frequently laid upon the power to use information before the information has been gathered. Moreover, the actual needs of the students have been sacrificed in not paying sufficient attention to the history of the last century. Thoughtful teachers are already realizing this, and the next ten years will see as great an advance as has been made since the presentation of the Report of the "Committee of Seven."

MODERN LANGUAGE CONFERENCE.

THE DISCIPLINARY VALUE OF MODERN LANGUAGE STUDY.

PROFESSOR TOBIAS DIEKHOFF, UNIVERSITY OF MICHIGAN.

It is reassuring to give, from time to time, a reason of the faith that is in us, or to prove, as clearly as possible, the title to our existence. It braces our hands when they are about to become slack and sink, gives us fortitude in the face of disappointment and apparent failure. May this be my excuse for presuming upon your patience in speaking upon a subject with which you are quite familiar. Often you may not even agree with me; for much of what I shall have to say is mere opinion, the truth or falseness of which can be demonstrated after long trial only. For myself I am rather firmly convinced that I am right in what I shall venture to assert, and I only beg your forbearance if some of my theses may seem somewhat categorical and dogmatic.

1. *Elementary study of modern languages is, or can be made, quite equal to that of the ancient ones as a means of mental discipline.*—The Classical Conference, two years ago, called upon some members of the Medical and Engineering faculties of the University to bear testimony to the value of training in the classics for the purpose of making good physicians and engineers; last year, a number of lawyers were called upon, or offered, to bear witness to the value of the classics, and this year it is the turn of the theologians. I am the last man to depreciate the value of classical studies in a broad and liberal education, and if, peradventure, next year testimony is needed in behalf of our old friends, the Greek and the Latin, as to their value in the preparation for thorough scholarship in the modern languages I should know of more than one willing witness: I myself would be glad to lend a helping hand to a worthy cause, which, judging from the amount of assistance called for, seems to be somewhat in need of help. All the more willing, since the representatives of the classics freely admit that, as auxiliaries at least, German, French and Italian are quite indispensible for classical students.

In the first place I am ready to admit cheerfully that a *theoolgian,* i. e., a Christian theologian, without a knowledge of Latin, Greek and Hebrew, seems to me quite helpless, though I know of more than one Christian minister who serves his flock with the greatest devotion and success without the knowledge of any one of the three. There is a difference between a theologian and a minister. For the theologian, in particular the Protestant

theologian, a knowledge of also German and French, indeed of also Dutch and Scandinavian, would open doors which no other keys can unlock.

Also the American lawyer who aims to be a scholar, a jurist, rather than a man of affairs needs a knowledge of Latin to study his Roman Law at the sources. But his Common Law is based on the laws of his Germanic ancestors, and unless he is at home in Anglo-Saxon and the other older Germanic dialects, the sources from which most of our laws are derived must remain for him a book with seven seals. I think most of our lawyers manage to limp along without much knowledge of either Latin or Anglo-Saxon.

And, with all deference to the opinions of the representatives of the medical and engineering professions, I beg leave to suggest that these great callings seem to have taken their biggest strides forward since the time when the classics began to lose their undisputed sway. It may be of some significance too that, as far as I know at least, neither in France, Switzerland, Germany or America, do the great polytechnic institutes make a knowledge of Latin a *sine qua non* for the pursuit of their technical training. And in our own engineering faculty, which need not take a second place for any other, I know of not a few men who do not assign any great part of their success to early training in the classics, simply because they had none. Neither are they especially indebted to the modern languages, except insofar as many of the technical journals are printed in French or German, none, as far as I know, in classic Greek or Latin. The same holds true of our medical profession, with the exception that more of the medical terminology is derived from the Greek. I wonder how much of their sudden prominence in medical science the Japanese owe to preliminary training in the classics?*

And yet undoubtedly the men advocating the study of the classics as a preparation for other intellectual pursuits are honest in their advice. The study of the classics does give mental power. But I seriously doubt whether it does so through precisely the channels through which this discipline is supposed to come. A year or two ago Professor Wenley in a public lecture before the Schoolmasters' Club was supposed to demonstrate, and did demonstrate to the satisfaction of not a few, precisely the reason why Greek and Latin afford unusually good mental training. It is because their inflectional system is so complete, so that a word can mean but one thing in a certain form, and the student's powers of observation and concentration are strengthened by the constant demands upon his attention in the attempt to place the forms and decipher the meaning of the Greek or

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* I am reliably informed, however, that Dr. Vaughan in his lectures to medical students urges most strongly that every one of them should study German if he has no time for any other foreign language. And since 1900 the diplomas of all higher schools of acknowledged rank in Germany admit to any department of the German university with equal standing, except the department of theology, for which preparation in the humanistic gymnasium is still the only recognized basis.

Latin text with which he may be engaged. Pardon me for venturing to make a few observations with regard to this much used argument. In the first place, it is a mere fiction that either Greek or Latin, or, for that matter, any Indo-Germanic language, unequivocally shows by special forms the relation of various words to the others in a sentence. And secondly, if they did, it is safe to assert that any one really able to read the language would ordinarily pay little attention to the special forms, except in obscure constructions. To be sure, those engaged in the more elementary work are not able to read in this sense. But that these inflectional endings are really of but little value for the interpretation of the language is incontrovertibly attested by the fact that the history of he Indo-Germanic languages is a history of the weathering of their inflectional systems. In English and French we have, for all intents and purposes, no inflection whatever left, and the German is steadily moving in the same direction. If these minute distinctions had been of any great use, they would never have been so completely dropped. But, in the third place, instead of demanding a student's close attention to his text these endings might rather seem well adapted to relieve him in a measure. Not long ago a young lady in one of my classes who was also studying Seneca had been cruelly deprived of her text provided with the marks of quantity, and found that even this slight approximation of Latin to our common modern languages was a serious hindrance. The task of committing the paradigms having been once mastered—and I should hardly consider this of any great disciplinary value—the more complete inflectional systems of Greek and Latin rather help to make these languages, in themselves, easier than otherwise.

But the educational value of language study does not lie primarily in the acquisition of so and so many strange forms and new words. This is purely a task for the memory. Does not education essentially mean the acquisition of the power to think, first the thoughts of others, and then, peradventure, now and then a thought of our own? A scientist has no claim to the name until he can apply the knowledge gained to any new problem that may obtrude itself upon his attention. Not the knowledge of dead facts, but of the active principles of any science is worthy of our toil, distinguishes the scholar from the masses, makes us educated. To be sure, every science, every profession, demands the fundamental knowledge of certain specific facts. But it is the thoughtful application of these facts that is of value. In any discipline, the chief aim is to cultivate the power to concentrate our minds, to think. In mathematics, too, the disciplinary value lies not in committing a lot of formulae, but in the indispensible close reasoning which arrives at the formulae, and in the discrimination which detects where any formula finds its application.

And the study of languages does not differ a whit from other studies in this respect. Educationally the acquisition of ever so many fine oral phrases in a foreign tongue, or the translation of volumes of meaningless

sentences in which our grammars abound, and may have to abound, is not to be compared with the real understanding of the single sentence: Was du ererbt von deinen Vätern hast, erwirb es, um es zu besitzen; or: Es sind nicht alle frei, die ihrer Ketten spotten. It might almost be said in this connection too, "the letter killeth, but the spirit giveth life."

To be sure, just as we have to learn reading our mother tongue in order to have access to the thoughts of the best men speaking it, so we must also learn the elements of a foreign language, its paradigms and vocabularies, in order to understand the thoughts stored up in them, and I would not say that this is wholly without value. Indeed, if incidentally some stimulus to real thinking can be given in the study of these elementary details, which is by no means impossible, the benefit may even be considerable. But the mere routine of acquiring an elementary knowledge of any foreign language is little better for a student than the sojourn of a few months in a foreign country. The advantages to be gained in either case about counterbalance those of the other.

But if the principal educational value of language study is to be sought in thinking over the thoughts treasured up in language, why not as well confine ourselves to our mother tongue and dispense with foreign languages in our curricula altogether? In many cases the advice would not be amiss at all. I consider wellnigh worthless all study of foreign languages which is not continued far enough to enable the student to read some work worth while in the foreign tongue, unless the language is wanted merely as a tool for the work in other fields, say, by a classical student in order to understand foreign commentaries on the classics, or by a scientist in his particular field. Well nigh worthless is therefore also all study of Latin which ends with four books of Caesar's Gallic War, or even of Greek ending with the Anabasis. I wonder if it could ever occur to our classical enthusiasts to recommend Caesar's Gallic War, for its intrinsic value, to be read in translation, except by an historian. Tacitus, Seneca, and Lucretius, Cicero, Virgil, Horace, Plautus and Terence, and even Ovid, yes,—but Caesar's Commentaries, what do they have to offer us, unless we want to study the history of military tactics or of bridge building, or have some other, remoter object in view. You may surmise my judgment upon much of the material sent us by publishers for beginning classes. The senseless vagaries of many of our comedy manufacturers and not a few of our novelists have no claim upon the time of a student, except to be used as material for drill.

But you are still waiting for the answer to my question as to why we should not confine ourselves to our mother tongue, not considering the demand for modern languages for practical purposes. Most men need the study of some foreign language in order to learn how to read. I do not mean by reading the fluent pronunciation of the words on any page. It is suggestive that the word *read* is etymologically related to the German word

raten, to guess, to divine: reading means to put ourselves in readiness to have great minds exert their influence upon ours; reading means to think the thoughts of others with as much intensity and acumen as the originators; to see from their angle, and with their vividness. To give the student *this* art of reading, is it not the highest aim of all liberal education, and in no small measure also of any technical training? But the youth is not inclined to exert himself unnecessarily. In reading his mother tongue he is easily satisfied if he gathers the general meaning of his author, which lies tolerably at the surface. Reading an author in a foreign tongue inexorably demands the exercise of his mental powers, because the foreign idiom, for a considerable length of time, is sufficiently obstruse not to yield any sense, unless the student gives his full attention, unless he *reads,* unless he divines. Of course, we have now and then students who are satisfied with anything the text may yield whether it be sense or nonsense. But they are not the rule. Educationally one work demanding and receiving close application to arrive at its content is worth more than the reading at sight of volumes of trash without a kernel of good hard thought. The surest method for annulling all benefit to be derived from the study of a foreign language is to tolerate slipshod work, which is satisfied with half an understanding, never reaches below the surface, gives no evidence of incisive thinking, barely masters what is in the lines, never presumes at all to read between the lines. More benefit can often be derived from an exact accounting for such apparently insignificant particles as *auch,* and *doch,* and *denn* and *ja* and a whole host of others in which every language abounds, than from the parrot-like reiteration of a whole page of text, though ever so glibly done even in the foreign tongue. One of my students, an American, unable to tell me, with any accuracy, in English what he had read, volunteered to give me the content in German, and really managed, tolerably well, to rearrange German poetry into a sort of German prose. This has caused me to think ever since. He had mechanically acquired just enough German vocabulary to enable him to read his German as superficially as he was in the habit of reading his English. His training had missed its purpose. If the foreign language teacher is at all alive to his opportunities and his duty, he has it in his hand to *force* the student to think if there is any thinking power in him.* There are some who have no power to think, and they will not learn to think though they may quite possibly learn to shine in the commonplaces of a foreign tongue. That is one of their accomplishments, much of the same intellectual value as dancing and knowing the intricacies of changing fashions. But if the student with brains does not learn to think in studying a foreign language, something is wrong with his instruction.

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*A good discriminating translation is as good as an exegesis of a text, and can not be made without some incisive thinking. In this consists the value and the legitimacy of translating in class.

Incidentally let me say that also translation from the mother tongue is well adapted to cultivate close application and discrimination, because in order to translate into the foreign tongue we must first know exactly the content of what is to be translated.

It is plain that, as far as we have gone, the foreign language to be learned may as well be Greek or Latin as one of the modern tongues, provided any one of them is sufficiently hard to enlist the student's undivided attention. In German I have rarely chosen texts that proved too easy; once or twice I have been obliged to abandon an author prematurely because he proved too difficult.

But one of the aims for which we are striving in language instruction is to make the student as much as possible *at home* in the foreign tongue. Understand, but one of the aims, not the great ideal. If it were, many a head waiter, many a guide in much frequented resorts, would have first claim to professorships in our universities. And when this aim is reached, when the student through prolonged close application and patient penetration into the thoughts of foreign writers has learned to *read,* in the significant sense, and the foreign idiom has, as it were, become a second mother tongue, is that the end of foreign language study? It is only the beginning, but too rarely attained. And if in elementary work, in forcing the student to think others' thoughts, the modern languages are quite on a par with the classics, they are in their value for further, maturer study as far in advance of the ancient languages, as modern civilization and modern thought is in advance of the systems of Greece and Rome. And this is my second thesis.*

For after acquiring, in the study of language, the habit of close application and the power to think, the language, unless it is made the subject of philological research, of which I shall have to say a word later, ceases to be an end in itself, and becomes rather a means for a far nobler end. In the last analysis, all sciences, the natural and mathematical as well as the historical and psychological sciences, the *Geisteswissenschaften* as the Germans aptly say, are but an expression of the way in which the world and man are mirrored in the human mind; or of the interpretation which man makes of the world surrounding him. What we ordinarily designate as literature, in particular, is an exposition of the finer, subtler relations of man to man, and man to his ideals, of man to his God. It is not only interesting but also in the highest degree liberalizing and liberating to study the answers which master minds of other nations have found for the

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* Professsr Andrew West, last year, maintained that where modern languages are substituted for Latin in any course, such courses can not be more than *specifically modern,* whereas Latin helps to make a course of study *universal* in intellectual value. Probably my judgment has been biassed by much study of modern languages, after my earlier classical training; but to me it would seem that, if modern languages make a course specifically modern, Latin ought to make it specifically ancient, rather than universal.

questions that beset our lives. If anything can impart to us the inesteemable grace of humility this will. Far be it from me to disparage the value of the classics, and particularly of Greek, in this respect. Their tragedians and philosophers hold aloft ideals many of which seem to be as far removed from us as they were from them. And, after all, they were the great teachers of all modern European nations. We owe them a debt of gratitude which can not easily be paid, and it is not asking too much, perhaps, to foster still that pious veneration which they have enjoyed ever since the great revival of learning swept over Europe. But there is such a thing, also, as being more Catholic than the pope himself, and I wonder if it were not acting more in accordance with the best of the ancient great masters frankly to recognize greater, higher ideals, if, peradventure, in the fullness of the centuries higher ideals have been vouch-safed to man. And there can be no doubt that the puzzling questions confronting the life of a thinking man of our day find a much more satisfactory answer, are at least brought much nearer to a temporary solution by the master minds of our day than by any of the ancients. I repeat, the claims of the modern world upon the attention of a student are as much more urgent than those of the ancients, as modern civilization and modern ideals are in advance of theirs. And so I do not hesitate to assert that, while equal in disciplinary value to the classics in elementary study, the modern languages, in particular the German, English and French, have a decided advantage over their old rivals for maturer, more advanced students.

I am aware that what I have just said does not altogether accord with the views quite commonly entertained. Our classical friends can get witness after witness from a number of the learned professions, indeed quite often also from among the teachers of modern languages, to the effect that the students best prepared, and most capable are those brought up on the classics.* But even granting that this is so—and it will become less so every year—it is rather an outgrowth of prevailing conditions than an indictment of modern language study. Allow me to call your attention to a few facts.

We all know that till recently, if not even now, the study of the classics has been commonly considered as a mark of special distinction. There are various reasons for this opinion, the strongest one being, perhaps, the time-hallowed reputation of the classics for their disciplinary value. At the time when a knowledge of the sciences exposed a man to the Inquisition, when the modern languages were disdainfully called the popular jargon, there was nothing left but mathematics, such as it was, and the classics. They were then really the only means for disciplining the mind, and it was then, that they earned their reputation. Things have

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* Professor West declares outright that the best preparation for the study of modern languages is training in Latin, not even Latin or Greek, but Latin. I forbear to make any comment.

changed since. But: *"Sei im Besitze, und du bist im Recht"*! Talk and argue against this notion as much as you will, we shall not be able to dispel it for many years to come.

Partly this privileged position is due to the very fact that the knowledge of Greek and Latin is a sort of accomplishment, their study a *brotlose Kunst,* a Gentleman's pursuit, to which no common man has any right to aspire, and which for this very reason lures the more ambitious.

But, more than anything else, it is their reputation of being difficult, hard to master. This prevents many less highly gifted students from entering upon the study of the classics, and correspondingly raises the percentage of able students engaged in them. This alone would readily account for the fact that many of our better students come with classical traditions. If I can trust my experience, this reputation for difficulty is not altogether deserved. I think our own Beowulf can, in this respect, quite favorably compare with many of the Greek classics, and any of the other older Germanic dialects offer all the resistance any one can reasonably ask for. And the modern languages, properly studied, are none too easy.

But there is also something in the study of the classics itself which makes for better scholarship. It is the fact that in our High Schools vastly more time is allotted to the study of the classics than to that of any modern language, English included. Indeed, Professor West, who holds no less an office than the deanship of the Graduate School of Princeton, is sanguine enough to assert that a boy well trained in Latin grammar never needs to study English grammar at all. Would you think a linguist capable of such a misapprehension? But need we, in view of this, be surprised at the inimitable calmness with which the representatives of the classics assert, that the difficulty of their subject demands and justifies this discrimination? But at all events, they enjoy this advantage, an advantage which should not be underestimated. I am not alone in asserting that it is much more difficult to prepare a student adequately for teaching a modern language than for one of the classics. The matter of pronunciation alone requires an infinite amount of patient drill. And no one would consider himself at all *well* prepared in a modern language without some delicacy of feeling for the language, without some *Sprachgefühl.* I am aware that the representatives of the ancient languages also give a certain amount of drill in pronunciation, and strive to acquire for themselves and develop in their students some *"Sprachgefühl."* But, unless the study of the classics has been radically changed since the days when I made my acquaintance with them, Greek and Latin are wholly languages on paper, whose characters every nation interprets more or less in terms of the values of its own tongue, or as nearly so as possible, so that an American or English Latinist would barely be understood by his European colleague; and what Caesar or Cicero would do if he should hear his modern interpreters is hard to imagine. I do not even seriously blame our colleagues if they neglect the

matter of pronunciation; for if one thing is certain, it is that we can never restore a dead language to life.* But a living language you *have* to learn to pronounce, or stultify yourself. And is it too much to claim, that no one can look really into the heart of a language, no one can have any real delicacy of feeling for a language, unless he knows its sounds How much of the charm, of the homeliness of our dialect literature depends upon our familiarity with the dialect coloring! A modern language teacher *can* become familiar with these intimacies of language which it is well nigh impossible to express on paper and which are therefore almost, if not altogether, unattainable for a classical student, or a student of any dead language. And in this respect, too, the task of the modern language student is infinitely larger and more difficult than that of his colleague. And yet this colleague usually enjoys a much longer preparation, and therefore often also more thorough scholarship in his particular branch. His students reap a double benefit: first that of his superior training, and secondly that which the favored position of the classics and the longer time allotted to them in our preparatory work inevitably gives if I am correct in my opinion that of a four years' course in language, not the first two and the last two are of the greater disciplinary value. Hence also professional schools which do not offer opportunities for continuing language work begun in the High School, make a grave mistake by accepting a minimum of work in a number of languages as an equivalent for a longer and more thorough training in any one, no matter whether dead or living.

On the other hand, the custom of having *short* courses in the modern languages has a deteriorating effect upon modern language study itself. A teacher with any sense of proportion will instinctively feel that a mere drill in forms without the prospect of any reading is woefully uninteresting and void of promise. And the endeavor to gain a little time for reading somewhere, directly leads to slovenliness in the elementary work, thus wholly depriving it of any educational value it may possess, and hampering the student on every hand in his later work. In order to make our beginning work as telling and efficient as ever the work in the classics can be, we must earnestly strive to lengthen the elementary courses, in order to make the work more thorough and of more practical and cultural value.

If it were not so hopeless I should also like to urge greater uniformity in our methods of language instruction, at least a more earnest endeavor, by whatever method, to reach approximately the same results. But it is not my purpose to stir up a hornet's nest. There is as yet more ardor and enthusiasm in our discussions of method than well considered definiteness

* I am tolerably familiar with a number of the older Germanic dialects, more intimately perhaps than I could hope to be with one of the classic languages after many years of study, and yet I feel all too painfully the lack of that indescribable instinctive devination of the meaning and coloring of my authors which gives me a feeling of assurance and kinship with a modern German or even an English writer.

or well directed zeal. The pioneers of modern language instruction accepted from our classical friends methods and aims worked out in the experience of many centuries, and therefore definite enough, but not altogether free from the encumbrances of past ages and outgrown ideals. Sufficiently emancipated to recognize some of the shortcomings of this older method, particularly if applied to the work in *our* hands, we are still not able to put anything in its place that will at the same time do justice to the different and larger demands of the modern languages as the vernacular of living, striving peoples, and the vehicle of growing culture and stirring thought and yet insure to the student that rigid drill in memory and thinking for which we look to the classics. Until something can be devised which will at all meet with the approval of a majority of our colleagues, I suppose each one will have to be left to work out his own particular method and defend it with more or less enthusiasm according to the degree of each one's faith in his own infallibility. Allow me at this time to warn you of but one danger.

A student of modern languages, and particularly of German in our part of the country, finds many opportunities to apply his knowledge practically. And the consequent delight of a young student in feeling that he has really, in a way, mastered a foreign idiom is both natural, and, perhaps, also legitimate; though possibly even a young student ought to know that the ability glibly to utter a few set phrases and laboriously to find words for a somewhat less familiar thought, is not equivalent to the mastery of a language. The resulting danger lies in the tendency to give undue prominence to this more showy, more spectacular, but doubtless educationally far less solid and valuable side of our work.

I trust I am not misunderstood: a student should, as much as possible, become familiar with the sound of a foreign language, and particularly in the elementary work we can well afford to spend some time in reaching this aim. Under favorable circumstances he may even learn to speak the language to some extent. But all this is an accomplishment, necessary it may be, as technical skill is necessary for a musician and other artists. But as technical skill can never *make* the artist, so also readiness to speak cannot really be the essence of language work. Our business is to go deeper, to delve into the thought of the author, and to develop the power to think independently. Where some teacher by the grace of God as Walther in Frankfurt, can harmoniously combine the two sides, so much the better. Unfortunately there are but too few of his kind.

I can not close without indicating in just a word the importance of modern languages for philological purposes, i. e., for the purpose of studying language as language, in its habits and its development, if I may be permitted to apply these biological terms to our subject. Let me merely remind you, that really scientific study of language began with modern philology, and in so far as modern methods of language study have found their way into the study of the classics, they have been borrowed from modern philology.

PHYSICS AND CHEMISTRY CONFERENCE.

THE CONTENT OF THE FIRST YEAR COLLEGE COURSE IN PHYSICS.

PROF. C. W. GREENE, ALBION COLLEGE.

It is not my purpose to even assume that I am able to outline in detail the content of a First Year College Course in Physics that will be adapted to the needs of the various institutions here represented. Any attempt to map out a straight and narrow way that must be followed by the student in order that he may derive from it the "summum bonum," any effort to determine just what topics must be included and what ones omitted would involve us in an endless controversy; for on these points the authors of our text books on college physics differ materially. The satisfactory completion of such a task would require a depth of inspiration and a breadth of view far beyond that which I possess.

It is my purpose rather to present my conception of what the purpose or aim of the first year college course should be and what general principles should be observed in order to attain the desired end. It is my hope that I may present some ideas that shall lead to a larger discussion of the subject at hand by the members of this section,—for such a discussion will undoubtedly throw many interesting sidelights upon the method of presentation and the aim of our first college course.

Even a general discussion of my theme should cover the following points: (1) What preparation shall we require of applicants for this first year college course? (2) What purpose as an educational factor shall the proposed course serve? (3) What shall the content of the first college course be in order that it may be a vitalizing educative factor, so that it may serve most largely the purpose which it is desired that it shall serve? To my mind there appears to be no possibility of drawing a sharp line of demarkation between the discussions on the second and third questions, and I shall, therefore, consider them under one head.

Regarding the character of the results obtained in the teaching of physics in the high schools of our country much has been said and written in recent years. In my opinion the descriptions of the unsatisfactory teaching of physics in our high schools, and the consequent dislike for the subject on the part of the pupils, at least insofar as they have reference to conditions in Michigan, have been much overdrawn. I am perfectly willing to admit that there are large opportunities for improvement in the teaching of physics, just as there are large opportunities for improvement in the

teaching of English, mathematics, the languages, and other subjects included in the high school curriculum. The longest step in the advancement of physics teaching will come with the employment of live teachers who themselves have a realizing comprehension of the subject matter which they are supposed to present; and upon whom does the taking of this step depend to a greater extent than upon the colleges of our country?

The shifting of responsiblity for unsatisfactory work done is well illustrated by alluding to the current dissatisfaction regarding the glaring inaccuracies in the use of English on the part of students entering college. The college instructor is prone to criticize the character of the high school instruction, and the city superintendent comes back with the statement that the instructor was engaged on the recommendation of the college. The writer's experience has been such that he has been enabled to view the proposition from both standpoints; and unhesitatingly affirms that we as college men are to be held largely responsible for securing any improvement in the character of English teaching, physics teaching, or any other line of teaching in the secondary schools of our state. I might justly add that our own State University has already exerted a powerful influence in raising the standard of physics teaching in the state of Michigan.

Another way in which our colleges in conjunction with the physics section of our Schoolmasters' Club can improve the character of physics teaching in our high schools, is by the dissemination among the teachers of suggestions regarding the selection of topics, their relative importance, methods of presentation, and laboratory equipment. It is my belief that the work of the National Committee on Physics Teaching will bear some fruit along this line. The report of the committee on the definition of the unit in physics which was recently made to the North Central Association, is worthy of our notice as bearing upon this point. This report was accepted by the association and ordered printed as their official definition from now on. While we may not be able to agree with this report in its entirety, it is suggestive and, therefore, worthy of our consideration.

The suggested definition of the unit is as follows:

THE DEFINITION OF THE UNIT IN PHYSICS.

1. The unit in physics consists of at least one hundred and eighty periods of forty-five minutes each (equal to 135 hours) of assigned work. Two periods of laboratory work count as one of assigned work.

2. The work consists of three closely related parts; namely, class work, lecture-demonstration work, and laboratory work. At least one-fourth of the time shall be devoted to laboratory work.

3. It is very essential that double periods be arranged for the laboratory work.

4. The class work includes the study of at least one standard text.

5. In the laboratory, each student shall perform at least thirty individual experiments, and keep a careful note-book record of them. Twenty

of these experiments must be quantitative; each of these must illustrate an important physical principle, and no two must illustrate the same principle.

6. In the class work the student must be drilled to an understanding of the use of the general principles which make up the required syllabus. He must be able to apply these principles intelligently to the solution of simple, practical, concrete problems.

7. Examinations will be framed to test the student's understanding of and ability to use the general principles in the required syllabus, as indicated in 6.

8. The teacher is not expected to follow the order of topics in the syllabus unless he wishes to do so.

SYLLABUS OF REQUIRED TOPICS.

This list of required topics is not intended to include all the material for the year's work. It is purposely made short, in order that each teacher may be free to supplement it in a way that fits his individual environment. It does include those topics which all agree are essential to a first course in physics, and which are capable of comprehension, at least to the extent specified in number 6 of the definition of the unit, by boys and girls of high school age.

*1. Weight, center of gravity.
*2. Density.
*3. Parallelogram of forces.
4. Atmospheric pressure; barometer.
*5. Boyle's law.
6. Pressure due to gravity in liquids with a free surface; varying depth, density, and shape of vessel.
*7. Buoyancy; Archimedes' principle.
*8. Pascal's law; hydraulic press.
9. Work as force times distance, and its measurement in foot-pounds and gram-centimeters.
10. Energy measured by work.
*11. Law of machines: work obtained not greater than work put in; efficiency.
*12. Inclined plane.
*13. Pulleys, wheel and axle.
*14. Measurement of moments by the product of force times arm levers.
15. Thermometers: Fahrenheit and Centigrade scales.
16. Heat quantity and its measurement in gram calories.
*17. Specific heat.
*18. Evaporation; heat of vaporization of water.
*19. Dew point; clouds and rain.
*20. Fusion and solidification; heat of fusion.

21. Heat transference by conduction and convection.
22. Heat transference by radiation.
23. Qualitative description of the transfer of energy by waves.
24. Wave length and period of waves.
25. Sound originates at a vibrating body and is transmitted by waves in air.
*26. Pitch and period of sound.
*27. Relation between the wave length of a tone and the length of a string or organ pipe.
*28. Resonance.
29. Beats.
30. Rectilinear propagation of light: pin-hole camera.
*31. Reflection and its laws; image in a plane mirror.
*32. Refraction, and its use in lenses; the eye, the camera.
*33. Prisms and dispersion.
34. Velocity of light.
35. Magnetic attractions and repulsions.
*36. Field of force about a magnet.
37. The Earth a magnet; compass.
38. Electricity by friction.
39. Conductors and insulators.
*40. Simple galvanic cell.
*41. Electrolysis; definition of the Ampere.
*42. Heating effects; resistance; definition of the Ohm.
*43. Ohm's law; definition of the volt.
*44. Magnetic field about a current; electromagnets.
*45. Electromagnetic induction.
*46. Simple alternating current dynamo of one loop.
*47. Electromagnetic induction by breaking a circuit: primary and secondary.
48. Conservation of energy.

In closing its report the committee has pointed out the following needs which have led to the above recommended definition of the unit:

1. The reduction of the number of required topics, by the omission of the more abstract and mathematical subjects, to a list that may be covered thoroughly in the time specified, and all the topics of which are within the comprehension of boys and girls of high school age.

2. The insistence of better understanding of the topics on the part of pupils by demanding their use in the solution of simple, concrete problems.

3. The making of the laboratory work more vital by allowing qualitative experiments to those who want them, reducing the number required to thirty, and permitting the teacher a very considerable degree of freedom in selecting his course in a way best suited to his individual environment.

In addition to the suggested course in high school physics, the first college course in physics should require as a prerequisite the completion

of the usual high school courses in algebra, plane and solid geometry. It is also very desirable that the course be preceded or accompanied by a course in plane trigonometry.

We now come to the consideration of what shall be the object and what the content of the first year course in physics in a college of liberal arts. This proposed course should be adapted to the average stage of development of the college freshman. The work should not be made discouragingly difficult, and yet it should be intensive in character. The writer does not agree at all with those who advocate, for either high school or college, a so-called "culture course" that shall be non-mathematical in character, that shall be made up largely of class demonstrations which serve merely to arouse curiosity, a course that purports to give a broad general culture without any sustained mental effort on the part of the student. Such a course can give the student nothing more than a mere smattering of physical principles without any real knowledge of their true significance. The so-called culture course, with its omission of practical problems which serve to give reality to and to fix the principles involved, curtailed as to intensity in order to give a "broad view" of the field of physics, is apt rather to create in the student's brain a mental mirage in which the facts, the principles, and the laws of the physical world would appear distorted all out of their natural relation. Any attempt to substitute "glittering generalities or curiosity arousing phenomena" for the fundamentals of physics is unsound pedagogy and can but result in failure whenever tried. My proposed course would, therefore, be intensive in character.

Quality should not be sacrificed for quantity. This means that not all of the general divisions of college physics can be introduced to the student by this first college course. I would suggest that selected topics in Mechanics, Sound, Light, and Electricity would furnish ample material for the content of such a course for a year's work. Limiting the number of topics to be presented renders it possible for the instructor to give attention to the development on the part of the student of accuracy and power of expression; it gives opportunity for the multiplication of the number of illustrations to be gathered from the practical life of the student, which give greater breadth of view of the physical principles involved.

Attention should be given to the analysis of terms used, to the analysis of the physical quantities studied so that the student shall clearly see what fundamental units enter into each of the given physical quantities. For example, the student should not only clearly see that force and distance are involved in the doing of work, but also to what powers the fundamental units of mass, length, and time are involved. A generous number of practical problems illustrating the physical principles under consideration should be solved and explained by the students.

Particular attention should be given to a clear exposition of the large physical laws and principles, such as Newton's laws of motion, the conservation of energy, and the principle of resonance; and frequent reference

should be made to them. Care should be exercised to secure the formation of clear concepts of inertia, force, momentum, velocity, acceleration, work, and power; for the correct analysis of every physical phenomenon reveals the fact that one or more of these quantities is involved. In short, this first college course should acquaint the student with the elementary facts and genral principles of physical science. It should furnish the student not with a collection of memory gems, but with a body of vitalized physical knowledge and with an introduction to the scientific method and spirit suited to the aims and needs of a liberal education.

It is my belief that the ideal first year college course should combine lecture, recitation, and laboratory work. I realize that there are practical difficulties in the way of carrying out this suggestion in some institutions. Nevertheless, wherever feasible, I strongly favor this correlation. During the lecture period the instructor by demonstration and exposition assists the student in the formation of correct concepts; in the preparation for the recitation the student learns to organize his knowledge. During the recitation period the instructor ascertains how thoroughly the student has grasped the subject matter of the lecture, and tests his ability to carefully and accurately express himself.

If four periods per week are given to lecture and recitation work, a two hour period spent in the laboratory each week would acquaint the student with the use of delicate instruments, would train him to make accurate, independent, and systematic observations. The computation of values of important physical constants from self-acquired data gives the student a more thorough realizing sense of the significance of physical quantities. This correlation of the various phases of the course not only cultivates in the student the power of correct observation and accurate insight into the phenomena of nature, but leads to the acquirement by the student of the scientific method of thinking, to the development of the ability to put into proper relations self-acquired data, to draw the proper conclusions, and furthermore to apply these conclusions to new cases that are presented.

A proper presentation of a first college course in physics can not fail to awaken in a normal student a larger interest in the every day affairs of the world; it can not fail to impress him with the fact that physics does not deal with meaningless abstractions but with physical principles that underlie the life of this work-a-day world of ours. Such a course enables him to understand the significance of the inventions that have given birth to the throbbing commercial life of to-day. Who shall measure the breadth of view and the pleasure that come to the student who understands the physical principles underlying the construction and working of the dynamo, the telegraph, the airship, the automobile, the "wireless," and countless other inventions that are being multiplied with ever increasing rapidity in this electrical age!

The fact should also be emphasized that many of the conclusions given in the general text-books of physics are at the most but approximations.

The student should not be asked to blindly accept these conclusions. There should be awakened in the student an unprejudiced desire to get at the truth through his work in the laboratory, and through his observations of phenomena in Nature's laboratory which is always about him. Thus in the life of the student there will be developed and intensified a respect for truth and a contempt for falsehood. Into the mind of the student will come a larger view of life, a larger insight into the significance of the laws of nature, which in turn will awaken and develop a keener sympathy for all life and will bring the student into closer touch with his Creator, the author of this wonderful physical universe.

I must not trespass upon the time alloted to a general discussion of our theme by the members of this section, and I, therefore, hasten to make a brief summary of the points I have desired to emphasize.

1. The first year college course in physics should assume as prerequisites (a) a course in high school physics of the general scope outlined in our discussion, now a requirement for entrance to practically all our Michigan colleges, (b) the completion of the usual high school courses in algebra and geometry.

2. The colleges should endeavor to fulfill their responsibility toward raising the efficiency of physics teaching in the high schools of our state (a) by increasing the number of men and women who shall have had special training for the work of physics teaching, (b) by the dissemination of helpful suggestions on selection of material and methods of presentation.

3. I have tried to point out that our proposed first college course should be intensive in character and, therefore, that the attempt should not be made to cover in a general way all the divisions of college physics in a year.

4. The aim should be to develop in a student accuracy and power of expression, to acquaint him with the scientific method of thinking, to give him a body of vitalized knowledge, to awaken in him a keener interest in the every day affairs of the world and a larger sympathy for his fellows, to inculcate into the student's life a deeper respect for and an unprejudiced desire to get at the truth.

5. In order to accomplish our aim I have suggested that much care must be exercised to lead the student to the formation of correct concepts, in particular the concepts of inertia, force, momentum, velocity, acceleration work, and power; that emphasis should be laid upon the large physical laws that underlie all work in physics; that conclusions that are but approximations should be recognized as such; that the student should be encouraged to observe, in and out of the laboratory, physical phenomena and to endeavor to interpret them; that the most satisfactory results are obtained by the correlation of expositon on the part of the instructor, and recitation and laboratory work on the part of the student.

In conclusion, it is the writer's belief that the status of physics teaching has never been on a higher plane than it is to-day, that never before have

men, young or old, had a more intelligent interest in the laws of physical science than they have to-day. The outlook is still brighter. Each of us can have his share in the progress and the development of a subject with which life comes into such intimate contact. We need not bewail the lack of genius, for as one of our greatest inventors, Thomas Edison, says, "Genius is but two per cent inspiration and ninety-eight per cent perspiration." This is the gospel of work, an ever important gospel. That first college course in physics will be the best which will lead the student to do for himself the largest amount of voluntary, thought stimulating, mental work.

THE ADAPTATION OF LABORATORY EXPERIMENTS TO LOCAL CONDITIONS.

H. B. HENDRICK, ST. JOSEPH.

In Michigan high schools where, in most instances, apparatus has been purchased from various dealers and hence has been constructed from different specifications, no laboratory manual can be formulated by any author which will meet the best demands of each school of the state. In fact, the only cases where apparatus and manual do fit, the manual must have been selected first and the apparatus then purchased to fit the directions of the manual. To outline a way to meet this difficulty is the purpose of this paper.

In the first place we assume, contrary to fact, that all laboratory directors believe in the use of a manual. We take the stand that in the average high school where classes are large and where the supply of apparatus is small there is much advantage to both instructor and student in having a guide in the hands of students, who are amateurs in the use of physical apparatus. Such a guide will save much of the student's time and may prove a saving to pieces of apparatus. It can work no injury unless its use makes the user mechanical.

Now we meet difficulties in selecting a satisfactory laboratory manual. In the first place no satisfactory laboratory manual is on the market, and in the second place if a new and well planned manual were available much of the old, yet useful, apparatus for students' use would not fit and so would lay undusted upon the shelves. If one of the older manuals is in use in our school, we are at a loss when we add new pieces of apparatus because the old directions do not fit the new pieces. We wish at this point to suggest a method which satisfactorily meets the above difficulties.

Let us assume for the purpose of illustration that an instructor takes up the work in Physics in a high school with a moderate supply of apparatus suitable to place in students' hands, and that no laboratory manual has been

adopted. He may begin by writing up experiments directed to the apparatus and so far as is possible he should keep in advance of the students' work. As many copies of the experiments as are needed may be written upon a typewriter, using carbon paper for producing duplicates. By a continuance of this method for two or three successive years, enough manuscripts will have accumulated, when properly arranged and bound, to make a useful manual. They may be added to, in the same manner, each successive year as new apparatus accumulates.

You will see at this point that the success of this plan contemplates that the instructor will stay a few years in one place.

Finally, it need not be a heavy task to get these manuscripts printed and bound in book form. If any instructor in our high schools to-day will put in a period of service in one place sufficiently long to formulate such a manual, he need not hesitate to present the proposition to his superintendent and board of education for their consideration. These officers are not often slow to act when they see that things are being done, and it is easily possible to interest them in printing enough copies to supply the school for several years.

To be sure there is always the disadvantage in the plan just outlined of not having cuts and diagrams which a more expensive manual might possess, but direct reference to the parts of apparatus placed in students' hands more than compensates for the loss.

After such a manual is completed containing all the students' experiments which are practical from the available apparatus in the laboratory, a typewritten supplement may be added at any time thereafter when enough newly added apparatus accumulates to make the idea practical.

As an example of the working out of the above suggestions, we beg leave to submit our personal experience. We offer in this connection for your examination a small manual containing sixty experiments, the explanations of which in each case refer especially to pieces of apparatus contained in our own laboratory. This book is the result of a growth of four years in a laboratory where about seventy-five dollars per year has been expended for apparatus, and where very little apparatus was in hand at the beginning of the period mentioned. A much more splendid manual might be worked out in almost any school of the same size as ours.

As a sample of results from the use of this book as a guide, we have for your examination a few note books covering the first semester's work of this school year.

In closing we might add that our board of education has printed enough copies of the manual to supply our students for five or six years, and that they are sold to students at first cost.

THE SIPHON.

PROF. E. A. STRONG, NORMAL COLLEGE.

Since the somewhat full discussion of the siphon by Daniel Bernoulli in the first half of the eighteenth century this simple piece of apparatus has been the innocent cause of much controversy and casuistry. Most of this discussion can be brought under one of two heads: definition, a matter for the physicist; or the idea of cause, a matter for the metaphysician. The secondary teacher upon introducing this piece will probably make such a definition of it as to exclude all forms in which the tube is filled with two or more liquids; in which there are openings or chambers along its course; in which bubbles of air interrupt the continuity of the thread of liquid; as also all forms used with a highly viscous liquid; those used in a vacuum; and those used or supposed to be used where gravity is suspended. The vacuum siphon, the chambered siphon, etc., are interesting pieces, but life is short and the physics course shorter.

In its historic form the outer branch of the piece opens into free air, but it simplifies matters to keep the ends of both branches immersed, raising or lowering the vessels. The teacher puts the piece into operation and calls attention strongly to the "conditions" or limitations of its action. To "explain" this action he calls to mind the facts,—all the facts,—and by wise questioning leads the students to relate these facts to each other and to what they have learned about the nature of a liquid, liquid pressure, and additional atmospheric pressure. An old-fashioned way, still effective and having the merit of generality, is to suppose an elastic film stretched across the tube at some wisely chosen point and to investigate and compound all the forces which the film sustains.

But the principal controversy has been concerning the effective cause of the action, using the term cause not phenomenally, as above, but logically or metaphysically. To some people cause is always personal,—the result of human volition. If such an one insists that the true cause of the flow of water in the tube is the removal of the air, by displacement or otherwise, I have nothing to say except that I am not interested in this view. Of course when a man comes upon the carpet apparatus gets wise; things happen;—only it does not concern me as a physicist, for I can neither predict nor measure just what will happen. In the same way if I am told that the cause of the breaking of a piece of apparatus was the removal of a support and not the pull of the earth; or that the cause of the movement of the ball in a rifle barrel was the pulling of the trigger of the gun; or that the turning of a stop-cock in a horizontal tube connecting two tanks in which the water stands at different levels, was the cause of the flow of water in the tube, I simply say that I am not talking with a physicist.

So when Professor Steinbrink maintains (and Professor van Mens-

brugghe, a higher authority, agrees with him) that in the siphon air-pressure is a side issue and adhesion (surface-tension) the real cause, I feel that he is talking metaphysics and neglecting the main issue,—the superior gravitation potential or potential energy of the more elevated mass of water. Professor Steinbrink adds that air pressure plays a very important part but only statically, while surface tension plays the lifting or dynamic part. Now logic in so far as it is a formal science proceeds by definition and inference, so that logically cause is what it is defined to be, and surely such a definition can be given as will fit the argument above. But who is helped by it? Certainly not the physicist. However, it should not be forgotten that surface tension does play some part in the action of the siphon, and when the outer branch opens in free air the "condition" should not be omitted that this outer branch may not be too small or too large any more than it may be too short, or the whole tube too long. If of capillary size action will cease before the liquid is lowered to the level of the outer leg; and if too large,—only a few inches in size, indeed,—before this point is reached, the air will pass up on one side and the water down on the other

RUMFORD'S VALUE OF JOULE'S EQUIVALENT.

PROF. E. A. STRONG, NORMAL COLLEGE.

Some years ago I heard a lecture by the late Professor R. H. Thurston, of Cornell, in which he maintained, with Youmans, Tyndall, and others, that Count Rumford was the discoverer and earliest exponent of the modern doctrine of heat. In this lecture he went further and asserted that Rumford's value of the mechanical equivalent of heat had a higher degree of accuracy than the first value obtained by Joule, and that this equivalent should be known as Rumford's equivalent.

I find nothing in print by Professor Thurston on this head except the following sentences in *Heat as a Form of Energy,* New York, 1890:

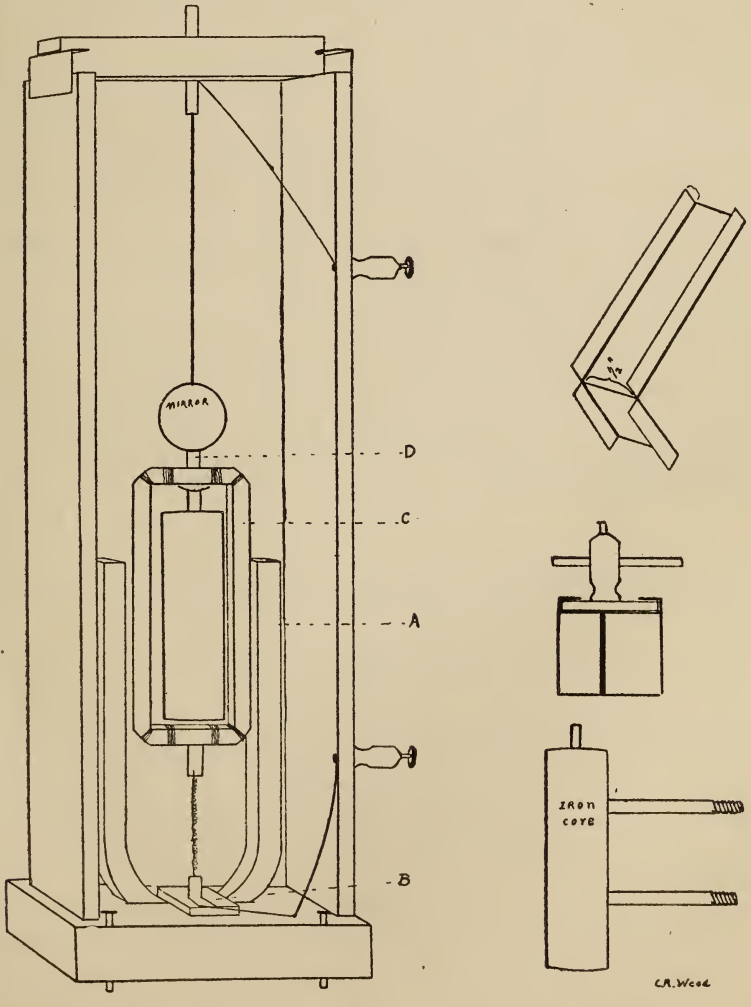
"The value of the mechanical equivalent of heat, as deduced by Rumford from his experiments, accords well with later determinations. Reducing to thermal units, or calories and foot-pounds, the accuracy of his work seems remarkable." And, further on: This makes "the mechanical equivalent, as deduced from Rumford's experiments, 784 foot-pounds to the thermal unit, or only one and one-half per cent more than that determined by Joule fifty years later." The fact that Rumford founded The Royal Institution and secured Young as Professor of Natural Philosophy and Davy as Professor of Chemistry, with Faraday as his assistant, charging them especially to investigate this question, should not prejudice but rather establish his claim. The further fact that he was execrated in this country

as a tory and discredited and bitterly denounced in England and France owing to his half insane conduct during his last years should also not prejudice his claim if it is a just one. Has any one seen any refutation of Professor Thurston's statements?

A SIMPLE FORM OF D'ARSONVAL GALVANOMETER.

C. R. WEED, OLIVET COLLEGE.

The galvanometer consists of a single U-shaped magnet with a coil suspended so as to vibrate between its poles around a core of soft iron. It is mounted in a wooden box with glass front.



The magnet (a) is sunk into a heavy base and held rigidly by screwing a small piece of wood (b) across the part embedded.

The coil (c) is constructed of one hundred and thirty turns of No. 30 copper wire wound around a continuous copper frame which serves to damp the vibrations. The coil is made as large as the magnet will permit, but there should be enough space between the coil and the magnet to allow easy adjustment. The frame is made by taking a piece of sheet copper and turning up an edge at right angles to the sheet. The sheet used should be at least nine inches long and 7/8 inches wide with 3-16″ turned up on each edge. Where the bends are to be made the turned up edge is cut and the plate bent to desired form. The support (d) is a piece of copper with an upright piece soldered on so as to give a surface to fasten mirror to. The end of the copper wire is soldered to this piece. It is insulated from the frame and bound on by winding with silk thread. A similar support is made at the bottom. To the support a mirror is fastened by soldering a square piece of thin copper and bending the corners around the mirror. Then these supports are soldered to a phosphur-bronze suspension ribbon. The upper end of the suspension fastens to a small brass rod which fits into a binding post soldered to a copper plate and so constructed as to move along the cross piece. The cross piece moves across the box, thus giving a three way motion to the adjustment. The bottom coil of phosphur-bronze is connected directly to the binding post.

The soft iron core is held in place by two machine bolts soldered into holes drilled in the core and bolted to the box. A support is made at the top of the core to hold the coil when not in use.

Three machine screws through the base act as leveling screws.

A straw indicator may be used as well as the mirror.

Such a galvanometer is sufficiently sensitive for all the work of a high school laboratory. All of its parts are in full view and are easily accessible. It is strong and easily adjusted. The entire cost for material is from a dollar to a dollar and a half.

EXPERIMENTS IN AGRICULTURAL CHEMISTRY.

MR. M. A. COBB, LANSING HIGH SCHOOL.

I shall use as the basis of my remarks the subject of milk. This topic is of importance in Michigan, in fact of growing importance, since we are becoming more and more a dairy state. Furthermore it illustrates considerable that is of chemical interest. I do not advocate the analysis of milk simply to test its purity, but rather to study a common product from a chemical viewpoint.

I shall speak first of the physical examination. The students will be

interested in examining milk under the compound microscope. It is an interesting sight to see the tiny fat globules, and an attempt should be made to filter them. The student will now readily understand the process of churning, namely, to unite all of these tiny fat globules into one mass.

The specific gravity can be obtained quickly by a hydrometer. The milk hydrometers (lactometers) are not expensive and are very delicate. Three samples should be tested: normal, dilute, and skimmed milk. He sees the density approach one as water is added and is puzzled in explaining why the density of skimmed milk of more than normal. Here is a practical application of density. The density of normal milk is about 1.030.

Still more interesting is the chemical side. To a little milk in a test tube, litmus is added and allowed to stand. You will get a variety of answers in asking the pupils to explain the result. What is the change and what brings it about? Simultaneously with the above, arrange tubes of milk containing a little formaldehyde, boric acid, etc., and if possible have some milk drawn directly into a clean sterile tube (a test tube plugged with cotton and heated). Follow the results with a practical discussion of the relation of cleanliness to the keeping of milk and you will give the student a stronger faith in chemistry and do a good deal of practical good.

A striking result occurs when a few drops of acid are added to milk. The whole mass seems to become a solid which dissolves when an alkali is added. Call attention to the milk that was allowed to sour and he will partially understand the result. Try to impress upon him that milk is an interesting mixture of soluble and insoluble substances, and we are trying to find out what they are and the changes milk goes through. The substance precipitated by the acid is casein, constituting 3% of milk, and is the basis of cheese. If you are near a cheese factory or can secure some rennet, add a few drops to some warm milk and in a few minutes we have the casein precipitated and an illustration of a class of chemical reactions similar to digestion, etc., somewhat puzzling, but entering into chemical changes in many instances. In this case the precipitated casein entangles the fat and forms the material from which cheese is made.

Questioning will bring out one way of separating the fat by allowing the milk to stand and skimming off the cream. As someone has remarked, the up-to-date farmer cannot waste time waiting for cream to rise and must resort to a quicker method, using a centrifugal machine. It will not be long before every high school, especially in the agricultural districts, will own a centrifugal machine for testing milk. I repeat that I do not believe the sole object is to test milk, but to use modern physical and chemical means to study common products and from a new point of view. A complete outfit, centrifugal machine, bottles, lactometer, pipets, etc., is not expensive, costing about $6. A student can learn to operate one in a short time. In testing, 17.5 cc. of commercial H_2SO_4 is slowly added to an equal amount of milk, by weight 17.6 cc. of milk. The casein is precipitated at first, but soon dissolves and leaves the fat. The fat and the solution is placed in a

bottle and rotated in a centrifugal machine for about five minutes. The fat is forced to the center, and the per cent can be read directly by the graduation on the neck of the bottle, that is, one graduation contains the amount of fat necessary to make 1% fat by weight in 17.6 cc. of milk. This experiment affords another application of chemistry, reveals the composition of milk, stimulates thought, is fascinating, practical, and some boy may discover that a certain cow is a star boarder.

The student will be interested in finding the per cent water or solids in milk as well as in various agricultural products, such as fruits, vegetables, grain, meat, and soils. A fine balance is not necessary for this work; one weighing to 1-10 or 1-20 of a gram is satisfactory. The coarser the balance, the more material should be used. A weighed evaporating dish is nearly filled with the substance, reweighed, and placed to dry. No oven is necessary in the winter; the dish may be placed on a radiator, steam pipe or furnace. I know of no more important work in elementary agriculture than the obtaining and realization of the per cent of water in common substances. It is interesting to have different students work on different substances, and place the percentages on the board. Considerable discussion will come from the results. An examination of the solids formed from milk will show a whitish scum which was formed on the surface of the milk. This is the albumin of the milk, similar to albumen of the egg, coagulated by the heat. *This* may be removed, washed in gasoline to remove the fat, dried and weighed, and the per cent calculated. The original solids will show the fat which may be removed by several washings of gasoline or ether. Weigh the dish after drying and the loss will be the fat and the per cent calculated. The dissolved fat may be recovered by allowing the gasoline or ether to evaporate. The amount of casein may be obtained by subtracting the fat, ash and sugar from total solids, after the former have been obtained.

There is still another substance in milk we should separate,—the milk sugar. A sample of milk is allowed to stand in a cool place and the fat removed. The milk is boiled to coagulate the albumin, and while warm add a few drops of a volatile acid (acetic acid) to precipitate the casein. The precipitate may be filtered and the filtrate is evaporated, and a solid is left. This is milk sugar, $C_{12}H_{22}O_{11}$, with a little mineral matter.

The student can now understand the souring of milk,—a part of the milk sugar is converted by bacteria into lactic acid. $C_{12}H_{22}O_{11}+H_2O=4C_3H_6O_4$. The approximate per cent may be obtained by using a known amount of milk and weighing the sugar, allowing for the ash. Nearly 5% of milk is sugar. The amount of acid produced in the souring of milk can be obtained by taking 25 cc. of milk, allowing it to sour, and titrating with r/10NaHO, using phenol phtalein as an indicator. Is all the sugar converted to acid?

Finally, the per cent of mineral matter should be obtained. This requires a more delicate balance, one reading to at least 5 mg. A known amount of milk is added to a weighed crucible, dried and ignited. The stu-

dent will be interested in watching the solids burn and realizing that milk contains a substance that will burn. This brings up its value to supply energy. How about sustaining life on a product that contains so much water? The ash should be tested for phosphorous and potassium, and the agricultural meaning of this discussed.

It would be of interest to test other substances, especially sand and muck soil, and relate this to the per cent of water in soils. It seems to me that in some localities we can well afford to spend some time on so practical a subject. But few instances can be found where so many features can be brought out in so graphic way, in so systematic manner, and without the need of much apparatus. Finally, the student will realize the following statement: Milk consists of minute globules of fat suspended in a solution of casein, sugar, albumin and mineral matter.

THE EXPERIMENTAL VIEWPOINT IN CHEMISTRY.

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As we look at modern Elementary Chemistry and compare it with the Elementary Chemistry of fifteen or of fifty years ago, we are able without difficulty to observe many changes and much improvement. I am not now referring to the mere increase in knowledge of the facts of Chemistry, but to a change in the method of presentation, a change which has affected Elementary Chemistry even more than it has the Science as a whole. I think there are two directions which this change has taken that are especially worthy of discussion amongst teachers. One of these is, that *thought* in regard to chemical facts seems to be more straightforward; the other, that the *speech* of Chemistry has become more literal. Both of these effects are the result of speaking and thinking closely in terms of *experimental facts.*

That the language of Elementary Chemistry has not always been as literal as it now is, is evident from an examination of the older books. The figurative language in which Elementary Chemistry used almost exclusively to be expressed was *sui generis,* and contrasted very strikingly with the much more literal language of Elementary Physics. I suppose there has never been a time when specific heat was defined otherwise than as the number of calories required to raise one gram of a substance one degree, or in some such terms as these. How admirable has always been the simplicity of the definition of the boiling point of a liquid, as conceived by the physicist. Imagine a text-book on Physics written by an old-time chemist and conceive, if you can, how he would define the boiling point of water. If he was of the "unreconstructed" type he would perhaps say: "The boiling point of

water is the condition at which the kinetic energy of its molecules has been so far increased, and the distances between the molecules have become so great, that the number of them in a given volume is the same as the number of molecules of oxygen in the same volume at 100° and 760 mm.," or words to that effect. Palpably absurd as an atrocity of this description would appear in a work on Physics, we have suffered in Chemistry in the past from too much of this kind of thing. Imagine the pupil taking this definition with him into the laboratory and attempting by the aid of it to measure the boiling point of water. A statement which is not in terms of experimental facts can be of little use in teaching an experimental science.

It may be worth while to pick out a few illustrations of the characteristics of modern Elementary Chemistry which have just been mentioned. That thought in Chemistry is more straightforward and more closely in terms of experimental facts is easy to show. For example, we used invariably to have bleaching mentioned under chlorine. Of course, even at that time, every chemist knew that chlorine by itself would not bleach a dry fabric. This may be illustrated by filling with chlorine a stoppered bottle, the bottom of which has been covered with concentrated sulphuric acid. When the gas has become dry, a piece of colored calico is pinned to a cork and the cork is stuck in the hollow inside the stopper. Finally the stopper is replaced in the bottle. Under these circumstances the rag will remain for weeks without changing its tint. A rag saturated with water does lose its color when exposed to chlorine, but we know that chlorine interacts with water to give traces of hydrochloric acid and hypochlorous acid, and that the latter when used by itself in aqueous solution is a powerful bleaching agent. Since, therefore, chlorine (when dry) and hydrochloric acid are not bleaching substances, it follows that bleaching should be discussed under hypochlorous acid. It is definitely misleading to discuss it anywhere else. The transposition has been made in consequence of a more careful consideration of the experimental facts.

The chemical change involved in bleaching by hypochlorous acid is simple. The substance loses the unit of oxygen which its molecule contains and hydrochloric acid remains. For example, when indigo is the dye affected, the following equation shows the formation of isatin, a relatively colorless substance, and exhibits the actual chemical transformation:

$$2HClO + C_{16}H_{10}N_2O_2 \text{——} \quad 2HCl + 2C_8H_5NO_2.$$

The explanation of the fact that hypochlorous acid will oxidize indigo, while free oxygen will not do so, has taken various forms. Is it not sufficient to say that hypochlorous acid is an oxidizing agent? The equation then shows exactly what has occurred. We are familiar with many other oxidizing agents and know that it is characteristic of them to excel free oxygen itself in their ability to produce oxidization. Ostwald explains the effect further by pointing out that, whereas the action of free oxygen upon indigo, if it could occur in practice, would liberate only 1800 calories, the oxidation of

the same quantity of indigo by hypochlorous acid liberates about 20,000 calories. Thus, in producing similar results, hypochlorous acid brings to the furtherance of oxidations in which it takes part a very much greater amount of avilable energy than does oxygen. These explanations, connecting the fact in question with other large groups of facts, and keeping experiment clearly in view, are a great improvement over the older and now discredited explanation. This, you will remember, was to the effect that the hypochlorous acid first lost its oxygen, and then this free oxygen performed the oxidation. Thus far the explanation was open to the criticism that free oxygen as a matter of act did not bleach indigo. Instead, however, of going back to the facts at this point, the contradition was avoided by the bold assumption that this free oxygen was *not* free oxygen, but a fairy variety of abnormal activity. Just as when we make an incautious statement, we are compelled often to back it up by fresh falsehoods, so to make this explanation sound plausible, it was found necessary to assume still further that this oxygen owed its activity to its *very recent liberation.* And at this juncture the perspiring story teller was suddenly rescued from his labyrinth of "supposes" by the brilliant idea that this oxygen must be atomic, while ordinary oxygen was molecular. Without stopping to consider how grateful he should have been to oxygen for happening to be a diatomic gas, the nascent and atomic states were quickly made synonymous terms and enthroned as realities to be utilized upon all convenient occasions. The only difficulty with this explanation is that it is wholly fictitious and is therefore an anomaly in an experimental science. The survival of the fittest, that is to say, of the ideas most fit to survive in an experimental science, have naturally led us gradually to dispense with fictitious explanations of this description whenever experimental ones are available.

Speaking of nascent oxygen naturally reminds us of nascent hydrogen. An interesting set of experimental facts throws a good deal of light on this subject. If we take a very dilute solution of potassium permanganate, add to it excess of dilute sulphuric acid, and then divide the solution into four parts (one of which is kept for reference), the needlessness of the nascent theory may quickly be demonstrated. Hydrogen gas is led through one of the solutions and no effect is observed. A little platinum-black* is added to the second and hydrogen led through the mixture as before. In this case the reducing activity of the hydrogen is greater and the solution is quickly decolorized. To the third tube zinc dust is added and here also the color quickly disappears. Why, however, should we say that it is "nascent" or "atomic" hydrogen which has performed the reduction in the last case, when

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* This can be made in a few minutes by placing granulated zinc in a solution of chloro-platinic acid ("platinum tetrachloride"). After the liquid has lost its color, the zinc is removed and the black precipitate, consisting of metallic platinum, is washed upon a filter. The same sample can be used over and over again for the above experiment.

we perceive that ordinary hydrogen in contact with platinum is just as active in producing the same effect Clearly it is simpler to classify this influence of the platinum and of the zinc upon the hydrogen along with the numberless contact actions with which we are so familiar. If confirmation is needed of this view we have only to consider some additonal facts. For example, if reduction by hydrogen is due to the presence of atomic hydrogen, all sources of free hydrogen should be equally active, whereas, if the effect is due to contact action, then the apparent activity of the hydrogen will vary according to the nature of the substances acting as contact agents. Now in point of fact the latter is the true state of affairs. Nascent hydrogen from different sources is notoriously different in activity. To cite only one example, when we electrolize dilute sulphuric acid with electrodes made of platinum, and cause oxygen gas to bubble through the liquid near to the negative pole, we find that the hydrogen reduces a part of the dissolved oxygen so that hydrogen peroxide is found in the liquid. When, however, a carbon pole is substituted, the hydrogen, although it is liberated with equal facility by the action of the current, and is presumably neither more nor less "atomic" than before, and is certainly equally "nascent,"—*this hydrogen* has no effect upon dissolved oxygen, and no hydrogen peroxide is produced. The nascent idea is not only purely fictitious but fails when all the facts are considered. The contact theory involves only facts. It classifies the phenomena of nascent action along with a large number of other facts described as contact actions, and so unifies our ideas.

To avoid misunderstanding it must be stated explicitly that modern views do not require us to give up the molecular and atomic hypotheses. Far from giving them up, we find them most useful in the explanation of many facts. For example, the molecular hypothesis throws much light upon the facts which we observe when ammonium chloride is heated in a horizontal tube. Why does the ammonia reach both ends sooner than does the hydrogen chloride? Because its molecules, once they have been liberated, are independent of those of the hydrogen chloride and move faster in every direction than do the latter. Which, of the two gases, is first liberated in this action? Evidently, when a molecule of ammonium chloride decomposes, the molecules of ammonia and hydrogen chloride must be formed *simultaneously*. The molecular theory is indispensible for the explanation of many things. Our contention is, simply, that hypotheses should be used only when required. We believe that direct correlation with *other facts* constitutes a more scientific explanation than does an indirect correlation by the help of a hypothesis, and that therefore the former process should receive the preference.

That our speech in Chemistry is in closer harmony with the facts than it used to be, is also easily demonstrated. We used to talk about "testing for sulphuric acid," whereas now we express our meaning better by saying that we test for the sulphate radical, or, if we are very much up to date, for the sulphate ion. (For beginners I think that the former term is

preferable to the latter.) We used to say that the yellow color of muriatic acid was due to the presence of "iron," and were disturbed to find that beginners took the statement literally and expected to see the metal (iron) in the material. This form of statement was necessarily confusing. Gradually we are learning that beginners, like children, are apt to take conventional phrases literally, and that for lucid explanation to beginners it is better to use exact language than to employ laboratory slang. We speak conventionally of a test for "chlorine," and only a chemist can tell whether we refer to the use of potassium iodide and starch as a test for free chlorine, or to the use of silver nitrate as a test for the chloride radical. Then a few minutes later we speak of bleaching by chlorine, when the substance to which we refer is hypochlorous acid. Naturally nothing but confusion could arise from loose forms of expression such as these. In this connection I should like to call your attention to the electromotive series of the metals, which is one of the most useful and literal devices we have for explaining a large number of chemical facts. The series runs as follows:

Potassium	Cadmium	Arsenic
Sodium	Iron	Bismuth
Barium	Thallium	Antimony
Strontium	Cobalt	Mercury
Calcium	Nickel	Silver
Magnesium	Tin	Palladium
Aluminium	Lead	Platinum
Manganese	Hydrogen	Gold
Zinc	Copper	

Each of these elements when in the free condition will displace any of the following elements from combination, when the latter element constitutes one of the radicals of a dissolved compound. The first use of the table (which may be hung in the class room as a chart) occurs when hydrogen is being discussed. The metals preceding hydrogen all displace this element from dilute acids. Those following do not. When we come to speak of the action of hydrogen upon oxides we note the fact that the oxides, beginning with that of zinc, are all reduced to the metallic state, while those preceding zinc are not so reduced. The oxides of mercury and the metals following it can be reduced by heating alone. When we speak of the occurrence of metals in nature, we note the fact that only those metals occur in the native condition which follow hydrogen in the list, and are therefore unable to displace hydrogen from the dilute acids (chiefly carbonic acid) contained in natural waters. Again, colloidal solutions of the metals towards the end of the list can be prepared, because these metals do not interact with water to displace hydrogen, while the preparation of such solutions with the other metals is naturally impossible. The stability of all the compounds of each metal is shown roughly by the position of the metal in the list. Thus the chlorides of the metals from silver onwards are decomposed by simple heat-

ing, while the chlorides of those above silver are more and more stable. To avoid misunderstanding it should be noted, however, that this table explains only the displacement of a *free element* by means of *another free element,* and has nothing to do with changes which occur in double decomposition. In actions of the latter description it is the insolubility or volatility of the product which determines the action, and never the activity which the elemen would have if it were present in the free condition. Thus, when cupric sulphate is added to lead nitrate solution, the "copper" displaces the "lead" because lead sulphate is insoluble. *Free copper,* however, never displaces lead in the metallic condition from any simple compound.

It is easy to multiply examples of the improvement which has taken place in the language used in Elementary Chemistry. Thus, instead of defining an atomic weight as "the weight of an atom," or even as "the relative weight of an atom" of the element, which, though strictly correct, is a purely theoretical definition, we now prefer to say that the atomic weight of an element is the unit quantity of that element by means of which the proportions of the element in all its combinations is expressed. (Of course a statement as to the method used in choosing the unit quantity is required for a complete definition.)

The test of the value of a definition comes when we ask whether the pupil could conceivably verify the definition in the laboratory. We could imagine his verifying the modern definition of an atomic weight, but the verification of the hypothetical definition, as it stands, is necessarily impossible. So, again, a formula may be said to represent the kinds and numbers of atoms in a molecule of a particular compound. If, however, we recall the necessity for connecting the theoretical with the experimental work we prefer rather to say that the formula is an expression representing the elements present in a compound, and the proportions by weight in which they are present. There is a difference of opinion amongst teachers of Elementary Chemistry as to whether definitions should be given at all. This question we are not, for the moment, discussing. If, however, we decide that definitions should be given, it is perfectly clear that they should be stated in experimental terms. The order of presentation involves three stages; first, the clear statement of the facts; second, if necessary, the study of the relations between these facts by the help of an hypothesis; thirdly, the statement in terms of experimental facts of the relations thus discovered, with careful exclusion of everything of a hypothetical nature. Molecules, atoms and ions are conceptions which help us greatly in explaining facts, but after the relations between the facts have thus been made clear, our final idea should as far as possible be stated in terms of facts only.

In this connection, let me suggest that a wonderful clarification of one's own ideas about many things can be brought about by the following exercise: Take the terms commonly used in Chemistry and prepare two definitions of each, one a theoretical definition, the other an experimental definition from which everything hypothetical is carefully eliminated. It will then

be evident how far, in our own minds, we have been confusing fact with theory. What, for example, is a graphic formula? Is it a mode of representing valence? Or shall we say that it is a mode of representing the arrangement of the atoms in a molecule? These are theoretical definitions. Or shall we say that it is a mode of representing the chemical behavior of a substance? This is the experimental definition. If we apply this process to such terms as: element, compound, law of definite proportions, law of multiple proportions, symbol, formula, valence, molecular weight, molecule, physical property, chemical property, physical change, chemical change, etc., we shall discover that even our own views have not always been as clear as we thought they were. To prepare satisfactory definitions, of both kinds, for the last four conceptions, for example, is not an easy matter, and a good deal of useful mental exercise can be secured by making the attempt. I do not wish to be understood to mean that this process is to be discussed with the pupil. It may even be better to avoid abstract statements of all descripions with young pupils. It is clear, however, that if any sharply formulated generalizations are to be given at all, then the ones in which experimental terms are used exclusively are the only ones which will be of permanent service to the pupil.

In the foregoing I have attempted, by means of illustrations, to show what appear to me to be some of the characteristics of modern Elementary Chemistry. I have tried to show that our thought, for example, about bleaching by hypochlorous acid, or reducing by nascent hydrogen, is now in closer touch with experimental facts. I have tried to show that our language is in many ways more literal and less impregnated with hypothetical ideas than it used to be. That these changes have been of great value in the teaching of the science cannot be questioned. Amongst the benefits which may be noted are the following: In the first place, there is the greater certainty that our statements will be understood by our pupils. In the second place, these improvements necessarily have brought about a closer relation between the instruction in the classroom and the work in the laboratory. The commonest complaint of our pupils used to be that there seemed to be too little connection between the practical work and the classroom work. I am convinced that most of this difficulty was attributable to the fact that in the classroom our language was wholly figurative, while in the laboratory, in direct contact with the substances and their behavior, the figurative vocabulary and the battery of figurative conceptions necessarily seemed out of place and was discarded. When we consider the use to which our pupils will afterwards put the training in Chemistry which we have given them in a secondary school, we perceive two additional advantages of the experimental method of expression. The pupils who later continue the study of the science under another instructor will have no difficulty in utilizing any facts which they may have acquired. The experimental method of teaching cannot help but fit on to later instruction of any description. A theoretical variety of instruction is almost certain to be more difficult of adjustment.

Again, many of our pupils, in most cases the great majority, do not continue the study of the science. It is evident, however, that when these go into business, an ability to talk in terms of the hypothetical conceptions of Chemistry con be of but little use to them. In business the things which count are, the ability to ascertain facts, to handle facts, and to relate them to one anoher, and the power to draw from the facts concrete conclusions which are suited to form a basis for action. The experimental viewpoint will make the study of Chemistry in a secondary school a valuable instrument for sound mental training. Whether, therefore, we consider our duty to the science which we have the privilege of teaching, or to the pupils, a part of whose mental discipline has been placed in our charge, there can be no question that a training which emphasizes the importance of facts, and trains in thought in terms of fact, will be, in the long run, by far the most valuable.

SOME SIMPLE ELECTRICAL APPARATUS FOR CHEMISTRY.

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From a brief examination of the different text-books in use in our High Schools today, we readily see that the question of how much Electricity should be taught in connection with the subject of Chemistry is not well settled. I have left such a question out of consideration. The following apparatus were designed to accompany Newell's Descriptive Chemistry.

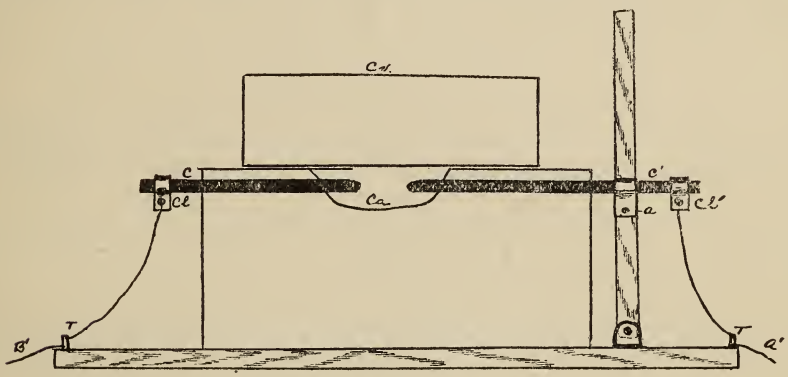
1. *A Cheap Voltaic Cell.*—In order that the pupil may understand the voltaic cell as well as he should, it is highly essential that he should become acquainted with it by actual use. For a large class this requires a large number and when purchased ready made means considerable expense. For the last two or three years we have been using a cell made by the pupils which costs so little that individual ones may be had if need be.

The jar is made by breaking off the top of a bottle by means of a cord or yarn saturated with some combustible like kerosene or turpentine. The yarn is tied around the bottle where the cut is to be made and ignited. After the flame becomes extinguished the bottle is held beneath a stream of water so that the water will come in contact with the heated portion.

The positive pole is the carbon from a worn out dry cell. The negative is a rod of zinc the kind used in a salamoniac cell. Strips of sheet zinc would be cheaper. The binding posts of carbons in dry cells could be used for connection here. The electrolyte may be any of the ordinary solutions. Such a cell with a chronic acid solution produced over five amperes and an E. M. F. of over three volts. The poles are held to the sides of the cell by wire clips.

2. *To Show the Conductivity of Solutions.*—It will be found that "Conductivity of Solutions," "Ionization," and "Electrolytes" will mean more to the pupil if the following apparatus is used: Two platinum electrodes are sealed in glass rods of about five inches in length. These prepared electrodes are held in place by a two hole stopper. These electrodes are connected to the incandescent light system. The current should be an alternating one to prevent electrolysis and passed through a lamp to reduce it. This lamp also serves as an indicator. The solutions to be tested are placed in test-tubes. The electrodes supported by the rubber stopper are thrust into the solution. If the conductivity is good the light burns brightly. The electrodes should be rinsed before inserting into the next solution.

The results are only rough, of course, but by using care in selecting the solutions the experiment will prove helpful and interesting. An ammeter placed in circuit would help to decide doubtful cases.



3. *A Small Electric Furnace.*—The accompanying cut shows the cross section of a small eletcric furnace made from a description of the Moissan furnace. In this one the brick and lime cavity are replaced by a block of limestone about 5 x 5 x 9 inches. In the top face of the base is hewn a cavity about 1 x 1 x 2 inches, also two longitudinal grooves to receive the carbon electrodes.

The cover is a similar stone with a cavity hewn in its lower face. Both base and cover should be bound with a piece of sheet iron or tin to keep the pieces in place should the heat be great enough to crack the stones. The carbons are regulated by means of the vertical lever, hinged at the base and attached to the carbon by means of the clamp Cl′. This clamp is attached to the lever at one place only, a. This allows sufficient horizontal movement. The electrodes are connected to a lantern circuit (alternating current 212 volts) by means of clamps. These clamps and other metal work are made from sheet aluminum—easy to cut and easy to shape. The bolts used are short stove bolts.

In such a contrivance calcium carbine, calcium phosphate, phosphorus, brass, and alloys are easily prepared.

Calcium carbine requires intense heat, the cavity should be small. Gas carbon or powdered arclight carbon is best to use.

Calcium Phosphide is prepared by heating calcium oxide, carbon, and red phosphorus. The phosphorus is placed in first in small quantities; this is covered by the other ingredients well mixed and pulverized. Some kinds of animal charcoal and calcium oxide will produce calcium phosphide.

Phosphorus is prepared as directed in Newell by heating a phosphate, charcoal, and sand. Phosphorus is separated and burns at the top. It sometimes sublimes on the faces of the stones and bursts into flame when the cover is lifted. The glass like slag remains in the furnace. This is exceedingly hot. Pieces of porcelain are easily melted when pushed into this plastic mass.

Brass is easily made by heating zinc and copper. The stones may be obtained from the refuse heap at a stone cutters. The corner of an old axe will prove a good instrument for cutting the grooves and cavities.

SOME CRITICISMS OF THE WORK IN CHEMISTRY AS ACCOMPLISHED BY THE STUDENTS IN THE HIGH SCHOOLS.

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My remarks are based on experience with students from our best high schools, who had studied chemistry in those schools, and who have pursued the same subject, some time during the past two years, in this University. They are made with the purpose of pointing out, in what respect the student's attainments in the subject not only may be or can be, but ought to be improved. This improvement, I believe, will be quite as much for the benefit of the student who does not pursue the study of chemistry after leaving the high school as for the one who does, and consists in establishing a closer connection in the student's mind between the different facts which he has learned, thus enabling him to do more effective thinking along chemical lines.

At present, it seems to me, each fact is acquired altogether too exclusively as an individual fact, with little or no relation to other facts. It is true that the student cannot, in many directions, acquire enough facts upon which to base generalizations; he can, however, be taught that a given fact is only one of a larger or smaller number of similar facts which go to make up a general one. For instance: He early learns that common salt and sulphuric acid react so as to produce sodium sulphate and hydrochloric acid, but that this is only an example of the larger fact, that whenever an acid and a salt interact a new salt and a new acid are formed, is not sufficiently

impressed upon him. Right here when this reaction is first brought under his notice is the place to emphasize the principle which it illustrates. Even his knowledge of neutralization, a subject which, it seems, is more often presented in its general aspect than the one just referred to, is too hazy to be of unfailing use to him. These two illustrations may suffice for my purpose.

I infer that the cause of this state of affairs lies in placing an insufficient emphasis upon the general features of the various topics, or in trying to cover too extensive a field of the subject, or to both, or sometimes, if I may venture the suggestion, perhaps to a failure on the part of the teacher himself to grasp the value of generalizations in building up a connection between the different parts of the subject, and in that way leading the student to think.

If the student is ever to think chemically, he must be able to classify substances, in some measure at least, and must know how members of any one class will behave toward those of any other class with which they are brought into contact. The statement that an acid and a salt react so and so has no value for him, of course, unless he knows what an acid and what a salt is. This classification should begin at the first opportunity, which may come when the chemical behavior of oxygen toward other elements is under consideration, a behavior which gives rise to oxides. These compounds should then be dealt with in such a way that the student will get a clear idea of their composition, will be able, in short, to define the class. It should also be shown experimentally that there are at any rate two important classes of these compounds, the difference in their properties being plainly shown. The subject of oxidation, having just been illustrated by the combination of oxygen with other elements, should also be treated here in such a way as to bring out its far reaching importance. If the latter cannot be satisfactorily accomplished when the topic is first introduced, it should be accomplished by recurring to it whenever an opportunity is afforded.

By thus calling attention to, and emphasizing, and thereby implanting firmly in the student's mind, a few well selected fundamental classes of chemical changes, rather than by attempting to get a survey of the whole subject, will he obtain the full disciplinary advantage which the study of this science can afford, and at the same time secure an equipment which will prepare him well for a more extended pursuit of it.

MATHEMATICAL CONFERENCE.

APPROXIMATIONS AND APPROXIMATION PROCESSES.

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INTRODUCTION.

A large number of processes used in mathematics, at all stages, are essentially processes of approximation. Probably the most widely known of these is the ordinary process for extracting square roots of numbers. One less usually recognized as an approximation process is ordinary measurement of length, area, or any similar continuous quantity.

While these processes thus form a very large part of the subject matter usually taught in the elementary schools, they would seem to be absolutely misunderstood by many teachers and by many writers. It is the purpose of the present paper to discuss briefly the elementary phase of this subject in its application to secondary and primary instruction, and to draw lessons of direct influence upon our teaching.

The writer is not one to urge the introduction of delicate distinctions and difficult arguments into elementary teaching; if difficult questions are broached in what follows, it is not because of any desire of the writer that these questions be introduced, but it is rather because these topics are actually being taught in our schools at present, in many cases from a standpoint so fallacious as to merit their eradication in cases in which no practical benefit will result; while, on the other hand, many very useful substitutes are ready to hand, far simpler than the false doctrines of our popular text-books, and far more useful.

Time was when the effect of modern knowledge was not felt in questions of elementary character, when teachers were content to consider their subject-matter solely from the standpoint of the elementary student; that time has passed; the teacher of to-day realizes that he must study beyond the student, that he must consider the topics of elementary instruction in the light of knowledge *beyond the range of the pupil* to whom the instruction is given, and that a statement or process is not correct unless it stands the test of such consideration. Some of the following remarks are made, not for direct use in the classroom, but rather for that indirect use which comes from fuller comprehension of the basis upon which the elementary instruction stands. We shall draw a distinct line between what is intended for actual instruction, and what is purely pedagogical and scientific reasoning directed toward the drawing of conclusions. In most instances it will be the conclusions, not the arguments by which we reach them, that will directly affect class-room work.

THE NATURE OF AN APPROXIMATION.

Approximations are essentially of two kinds: (a) those which arise through observation, in which the error is caused by the lack of precision of our instruments and of our senses, and in which there is a bound to the exactness which we can attain; and (b) those which arise in a mathematical process, in which the error is caused by the fact that the process would require an infinite number of steps, of which we can perform only a few, and in which there is no bound to the exactness which we can attain.

Approximations of the first kind are so ordinary as to deserve little comment, except from a pedagogical standpoint. It is one of the most important lessons that a child can learn in the school that the quantities with which he will have to deal in actual life are not to be accurately stated, as are the quantities usual in the text-books of to-day. But this lesson, important as it is in the development of common sense in the application of mathematics, is seldom learned in school. Few problems are assigned in which the inexactness of measurements is recognized;—such problems should be given. Few problems are given which involve the necessity for finding the effect of an error; such a problem as the following: "How nearly accurate must the measurement of the side of a square be made in order that the computed area shall be correct to within one square foot, if the side of the square is a little over ten feet long?" (The answer to this problem is about ½ in.) Such problems will improve the conception of actual work very materially. Or again, "In selling a bolt of cloth 50 yds. long, how carefully must the measurements on each yard be made in order that not more than 2 ft. be lost?"

Another lesson to be learned is the futility of carrying mathematical calculations based on observed data beyond the degree of accuracy of the data themselves. This should constantly be impressed by the teacher, and work carried beyond a reasonable limit of exactness should be condemned (as a waste of time) as sharply as work which is not sufficiently exact. Even a long division should not be carried beyond the reasonably "significant" figures. As an example, in a problem requiring the number of bolts of wall-paper required for a given room, the pupil should not be allowed to express a fraction of a bolt; and in other instances, it should be expected that he have a rational idea of what reasonable accuracy means. It should be noticed that the question of significant figures is not a question of decimal places, though the two are often confused. Thus the number of significant figures in 3900 is the same as in .0039, though the number of decimal places is different.

It is the ideas which I have just mentioned which serve as a connecting link between approximations of the first kind, observational, and approximations of the second kind. mathematical. For, were it not for the fact that ordinary life *furnishes* and *demands* only approximate statements of quantities, a mathematical process which furnished only approximate results would not be a useful one. As a matter of fact, of course, an approxima-

tion process is as useful, practically, as an exact process. To this we shall recur.

The nature of an exact (or mathematical) process of approximation is readily understood, but the common presentation in text-books is not always trustworthy.

The difficulty in a mathematical approximation usually arises not so much in the process itself, as in the question as to whether or not the quantity to which we wish to approximate is really itself *defined.* In order to give an illustration of the process itself, let us take an instance in which there is no question of lack of definition. Such an instance is the reduction of 1/3 to decimal form. The quantity to be approximated is certainly defined —it is 1/3. We show that we can write a decimal which (together with all which follow) differs from 1/3 by less than any desired amount. It is important to notice that the desired degree of correctness must be stated *first*; the decimal which attains this degree of exactness can *thereafter* be mentioned. Essentially this problem contains the principle of all mathematical approximations. It is to be noted that:—

(1) the quantity to be approximated to must be itself *defined,*

(2) there must be a process of determining an infinite number of approximations to the given quantity,

(3) it must be possible to select an approximation which (together with all which follow) differs from the given quantity by less than any *pre*-assigned amount.

THE VALUE OF AN APPROXIMATION PROCESS.

The value of approximation process depends vitally upon the fact that human observations are open to error, and that therefore approximate results are all that are practically necessary.

In order to serve its ends thoroughly, however, a mathematical process must be capable of being pushed to any degree of exactness whatever, since the process may be applied in different problems in which the degree of accuracy required may vary widely. Even this need, however, is limited to a certain degree. The value of π, for example, can be found to any number of decimal places required. As a matter of fact, its value has never been estimated beyond 707 decimal places, and no calculation has ever been performed in which the degree of accuracy actually required for π was anything like as great as this number of decimal places would represent. Nor is it probable that any calculations will ever require π to even one hundred decimal places; even fifty places would suffice to compute, from the radius, the volume of the sphere which encloses the whole solar system to within a fraction of the volume of the smallest known microbe.

Thus, while not here recognizing as a mathematical approximation process any process which fails to reach any desired degree of exactness whatever, it is well for us to keep in mind that other approximations may have all the real practical value of a mathematical approximation.

Again, in order to be of practical service, it must be possible to estimate (at least an upper bound of) the error made in any given approximations. Unless this can be done, the process itself is open to grave objection, since there would be no way of telling when the desired degree of correctness was attained.

The student should invariably be given some notion of the degree of accuracy represented by the approximations he is obtaining, and he should not be allowed to use approximate values (e. g., of π or of $\sqrt{2}$) to more than a reasonable number of places. Thus the use of the common value of 3.1416 for π in the computation of the volume of a quart measure, for example, is absurd, for the tin would have to be cut to within about one ten-thousandth of an inch of the computed value of its dimensions in order that the computed figures should have any significance.

APPROXIMATION PROCESSES IN GENERAL.

Any process which has the characteristics mentioned above is recognized as a worthy mathematical process. In fact, even for theoretical purposes, such processes are always, without exception, absolutely legitimate, if the process is not abused by the introduction of unwarranted assumptions. To make this quite clear, the writer will state the preceding characteristics in mathematical language:

Given a constant k, which is defined, then there is an approximation process for finding k in terms of desired forms if a set of numbers

$$a_1, a_2, \ldots, a_i, \ldots$$

of the desired kind are known, such that

$$a_i - k$$

is less than p whenever i is greater than N, where p is first assigned, and then N is found.

To those who are familiar with infinite series, it will be clear that we have to deal here with the infinite series

$$a_1 + (a_2 - a_1) + \ldots + (a_{i+1} - a_i) + \ldots$$

and that the sum of this infinite series is k. In fact, this is, to my mind, the best way of presenting the subject of infinite series to a young student. If it were generally recognized that there is no essential difference between the question of numerical approximations and the topic of infinite series, it would tend to materially increase the respect in which approximation processes are held, and it would do away with a great deal of nonsense which is frequently heard and frequently printed, concerning both of these subjects. This remark is made, however, for the consideration of the teacher, and it should affect his class-room work, if at all, only indirectly.

Again, it is true that

$$\lim_{i=\infty} (a_i) = k,$$

that is, the given quantity is the limit of its approximations. So far as the writer is aware, after a considerable inspection of the subject, absolutely every limit process which occurs in elementary mathematics is of this character—meaning by elementary mathematics, the mathematics of the secondary and primary schools.

It is to be strongly urged that the simple notion of approximations, which is necessary in elementary mathematics in any event, be made the sole topic among these three equivalent topics of approximations, limits, and infinite series, in elementary school work, both because the idea is more quickly grasped, and because the other two topics have been presented fallaciously in our popular text-books, which has given rise to traditional misstatements which will be very difficult to eradicate.

As stated before, any constant is the limit of its approximations; but on the other hand, the converse is not true, for there are examples of limits which cannot be regarded as approximation processes; these exceptional forms do not occur in elementary work, however, and the very difficulties involved in their consideration would be eliminated from elementary instruction by confining ourselves exclusively to approximations.

THE ABUSES OF APPROXIMATION METHODS.

One fundamental abuse of approximation methods is the failure to recognize that they *are* approximation methods. For example, in the ordinary process for square root, the writer is sure the *impression* is often given that *there exists a process* for actually writing down a decimal which *is* the square root of 2, for example. What *is* really done, of course, is to write down successive decimals whose squares differ from 2 by less than any *pre*-assigned amount if the process is sufficiently extended.

Another very serious and fundamental error which is woefully prevalent, is the failure to realize that the quantity to be approximated must be *defined*. This failure is readily remedied, if it is once recognized. Thus it will be noticed that it has just been stated that a succession of decimals could be found whose squares approximate to 2; the writer was careful *not* to say that a set of decimals could be found which approximated the square root of 2. And this is very fundamental. For 2 is a perfectly defined number, and decimals whose squares approximate to it are readily comprehended; but is it clear in advance what the square root of 2 is? Is it a defined number? Do we know that there is a number whose square is precisely 2? Most assuredly we do not; in fact there is no integer whose square is 2, nor is the square of any fraction equal to 2, as will be seen upon inspection. What is this thing, then? Is it a number, yet not an integer, and not a fraction? Who ever heard of such a thing—*at the time square root is first taken up?*

Indeed, then, it is much simpler to say that decimals can be found whose squares approximate 2, than to say something about such a hazy concept as that just mentioned. It is this that the writer would urge—not that fine disinctions be introduced in teaching, but that statements be made in as

simple and as correct a manner as we can, and that we choose a statement surely if it is at once simpler and more correct.

There is no objection to using the phrase "the square root of 2" if this process has once been properly introduced. In fact the most careful definition of the "square root of 2" is to *define* it to be the number which is approximated by the decimals found in the process just described. Nor need this discussion be made abstruse in actual teaching. For, in order to be quite within the bounds of decent mathematics, all that need be said is: "In this process we find numbers whose squares come nearer and nearer to 2, so that the square of our result is as near to 2 as we please, if the process be carried on long enough. We recognize the unending decimal produced by this process as a number, and call it the 'square root of 2.' While this statement is possibly strange to you who are more familiar with what we have all been taught in our own elementary education, its strangeness to us is not an element of difficulty to the child who sees it for the first time; and it would not seem as hard to believe or comprehend as the essentially false statements which are more in vogue.

AREAS AS APPROXIMATIONS.

As a notorious illustration of the abuses of approximation processes, let us consider the ordinary treatment of areas.

A common definition of the area of a square, for example, is that "the area of any square is the number which expresses the number of times which the given square will contain a certain unit square chosen as the unit of area."

The writer has no quarrel,—just now,—with the man who will say that the square to be measured contains the unit square two-thirds times, though two-thirds times is self-contradictory; but this can easily be remedied by properly subdividing the unit square.

But how shall a square whose side is irrational,—say the fourth root of 2 or π,—be measured in terms of the unit square? For here no common measure exists. Even in case of the square whose side is the square root of two, it is impossible to find a single measuring square which will really fit an integral number of times in the unit square and in the given one.

It is not hard to see what is really the case; certainly it would be easier to the student to tell him simply the truth about the matter, rather than to have him *puzzle over how he is going to fit squares into others into which they really do not fit.* The *truth* is that we are face to face with another approximation process; and the writer sees no reason for disguising the fact. To be sure, it is impossible to find a square which will fit in the unit square and also in the square to be measured an integral number of times. But we can easily see that by choosing small enough squares which fit precisely in the unit square, we can fill the square to be measured as nearly as we please with the same little squares. Hence we can find a set of approximations which express the areas of squares which differ from the given one

by as little as we please. The area of the given square is really the number approximated by these values.

It is seen that the notion of definition of the area is really involved in the last statement, and the area of the given square, which was left undefined by the original definition, is now quite a definite and defined thing.

To the student we may simply say that we divide the unit square into hundredths, ten-thousandths, etc., by dividing the side into tenths, hundredths, etc., and we apply the smaller squares to the area to be measured. While these may not precisely fill that area they will do so more and more nearly, and the numbers obtained by counting these smaller squares intelligently are approximations to what we call the area of the figure which we desired to measure.

This definition really *defines,* which is an advantage to be treasured. It applies as well to circles, triangles, etc., as to squares; and it prepares the student thoroughly for a reasonable understanding of area in all its phases.

Such a theorem as that two circles have areas which are proportional to the squares of their radii, really comes within the possibility of *proof,* if we proceed in this manner. It is a curious commentary that it is especially in those text-books in which the false assertion that all the theorems of plane geometry are proved *logically* from the axioms is proclaimed most vociferously, that we find such fallacious proofs given the utmost prominence. Is it not evident that no theorem can possibly be proved about the areas of circles in a book in which no definition of area is given which in any sense applies to a circle? Nor is reference made to any special text. These fallacies have become traditional, so that many an author has inserted them without real forethought.

I will lastly call attention to the fact that all the theorems on similar triangles involve these same questions, and that these theorems cannot be proved unless the approximation in the very definition of areas is recognized.

INCOMMENSURABLE RATIOS.

The fallacy just mentioned enters in a general fashion into the so-called "proofs" of the incommensurable cases in geometry. We shall not enter upon these theorems at this point in detail, but shall limit ourselves to a demonstration of the worthlessness of the proofs most commonly given, from which one should conclude that these proofs ought to be omitted entirely, for the most part.

Taking a simple instance, let us consider the proposition that the areas of two rectangles whose bases are equal are proportional to their altitudes. Upon some inspection of the most usual proofs, we see that (in the "incommensurable case") the areas in question cannot possibly both be defined under the definition quoted above; hence the theorem states a fact about quantities which are not even defined. If it amounts to anything, when given in this manner, it amounts to a *definition* of the previously undefined

concept of the area of the rectangle whose height is incommensurable. But if this were really the intention, surely a so-called "proof" would be rather out of place.

Moreover, the fact stated in the supposed theorem involves the ratio of two heights which are incommensurable; again here, the usual definition of length of a straight line segment leaves such incommensurable lengths undefined.

The supposed theorem is therefore a statement about certain hazy, undefined concepts, and the statement is made that the ratio of these undefined things is equal to the ratio of two other undefined things.

Possibly this is bad enough, though I presume it will be said that I am drawing fine distinctions. But if one does not wish to draw fine distinctions, what is the use of this theorem, anyway? For it is in itself an attempt to learn something about that peculiar case in areas in which no common measure exists. Strange, is it not, that one should be anxious to prove theorems which draw fine distinctions about abstruse concepts, while one at the same time argues that these very concepts ought not to be defined because that would be drawing too fine a distinction. Does this not resemble closely the camel-swallower who strains at proverbial gnats?

The writer would choose the gnats and eschew the camels. It is urged that you consider the advisability of doing the *small* thing of defining what these areas are, but that you leave until a much later time the study of theorems concerning them. The theorems are too hard; the definitions are quite enough—possibly even the definitions are too abstruse. It is not at all objectionable for anyone to omit the whole matter; it is not objectionable if anyone pleases to give the definitions and omit any theorems; it is not objectionable if there be a preference for giving the definitions and then proving a few theorems—provided the proofs really prove anything; but it seems reasonable to object to proofs of theorems without the definitions, or to proofs which rest on a fallacy.

Possibly these arguments will suffice for some minds. The author knows, however, that traditional arguments are dear to the soul, and concludes that an additional *coup de grace* will not be superfluous. For if to anyone of you the proof of theorems about undefined things is endurable, surely no one of you will defend a plain case of non-sequitur fallacy in the logical part of the proof. You will remember that in all these "incommensurable case" proofs as usually given, a certain limit theorem is supposedly used, namely that "if two variables are constantly equal to each other, their limits are equal." This limit theorem is of course correct; in fact it is an absurdly trivial statement of a fact which is more than obvious,—and utterly useless for any purpose whatever. But, in the incommensurable case proofs, its meaning is *distorted* and it is used to cover a *fallacy*; for the thing which it is there desired to prove is not the preceding statement at all, but rather this one—"if two variables are equal for all *except the limiting value* of a certain controlling independent variable, the two variables are equal for the

limiting value of the controlling variable." Now this statement is utterly false, as witness the geometrical progression whose first term is x^2 and whose common ratio is $1/(1+x^2)$: the sum of the (infinite) progression thus defined is $(1+x^2)$ for every value of x except $x=0$; if the reasoning employed in these "incommensurable case-proofs" were correct, the sum of the progression would necessarily be 1 when $x=0$, whereas the sum is actually 0 when $x=0$. *It follows that precisely the same logical argument used in demonstrating these theorems would also show that* $0=1$.

The writer has had a certain cynical pleasure in hearing these so-called proofs for the incommensurable cases defended—not upon the ground of any usefulness of the results, which might really be a defense—but rather upon the ground that they strengthen one's reasoning powers! *Rather* they are a *travesty* on argument; an *abortion* of reasoning to which there is scarcely a parallel in all the devious labyrinths of human fallacies.

Nor has one of the more complicated among them been chosen for an illustration; purposely the first and simplest of these propositions was chosen. Had the writer desired, he might have found one with a few more flaws; there is no one among them which has *less* than the one here used for illustration.

No question of doubt should be left in the mind of any one of you about the actual correctness of the theorems themselves. The theorems are all true as usually stated, provided the quantities which enter in them are properly defined. The writer has merely pointed out that the demonstrations usually given do not demonstrate; and he has urged that the definitions be given, with or without the (correct) proofs of the theorems.

LIMITS.

I have mentioned that any approximation process furnishes numbers whose limit is the quantity approximated. All questions involving the kind of limits which occur in elementary (secondary and primary) mathematics can be treated upon this simple basis, and the word limit need not be introduced.

As a justification for the advice to omit all treatment of limits, the writer would submit that there is scarcely a popular text-book upon the market to-day in which this topic is correctly treated, while in many popular texts the treatments are positively absurd. Does it not follow that a topic so abstruse as to cause the writers of texts to flounder, is not quite the thing to present to children? For this reason, then, all discussion of limits will be entirely omitted from this paper, except to advise this omission of all reference to it, including the bizarre theorem quoted above.

Simply as a hasty justification to those present who are quite expert in handling limits, the writer will say that the remark above made, "that there are limits which do not correspond to approximation processes," refers to limits taken over an assemblage which is not countable; for it is evident that a true mathematical approximation process corresponds to a limit taken on an enumerable assemblage.

THE FETISH AND THE TABOO IN CERTAIN APPROXIMATION PROCESSES.

Our traditions have given rise to certain curious prejudices regarding approximation processes which resemble closely the fetishes and the taboos of certain aboriginal peoples.

From a logical standpoint, there is, of course, no reason for these prejudices. There is no real distinction, in principle, between one process of approximation and another, provided they both fulfil the requirements mentioned above, and provided both are valuable. Hence, since approximation processes are necessarily recognized as perfectly good mathematics,—since, in fact, many portions of mathematics depend vitally upon such processes, there appears to be no justice in any discrimination against any given one.

Several need only be quoted, however, without any explanation, in order to make the actual prejudice vividly clear.

The ordinary process of square root is one of the fetish class. It is certainly recognized as absolutely legitimate, and one scarcely questions the propriety of asking a student to solve a problem which involves finding a square root; it is usual to say that such a problem can "be solved."

Contrast this state of affairs with the *taboo* against the trisection of any angle by means of ruler and compass. It is usual to say that this problem cannot "be solved." Yet I can surely trisect an angle by means of compass and ruler in precisely the same sense in which I can find the square root of three, for the latter is an approximation process, and it is perfectly easy to set up a good, *and very rapid,* approximation process for trisecting an angle by compass and ruler, if one only starts by random choice of a trial trisection somewhere between one-half and one-fourth the given angle, and then proceeds by successive steps in a perfectly natural manner.

The process just suggested is eminently practical and useful; it is precisely as justifiable as the process for finding square root; it has all the necessary qualifications of a good mathematical approximation process; it is the process actually used by all draughtsmen and mechanics. Yet who ever heard of such a thing as teaching this eminently practical, useful, and *thoroughly mathematical* process, simple as it is, in a course on geometry? If some of you have actually done this,—may your race increase,—have you not done it almost furtively,—somewhat apologetically? Have you not thought that it was not really mathematics? For the most part certainly this process is not given,—it is tabooed. Instead we give a fallacious proof of a useless "incommensurable case," and rub our hands in smug satisfaction over the accomplishment of something really "mathematical"—forsooth!

I should mention also that if any one of you has to divide a circumference into *five* equal parts, I can commend to him most heartily that he do so by approximations, rather than by the ordinary construction; and that he do so boldly, knowing and asserting most strenuously that he is doing just as *mathematical* a piece of work as was ever done. We should beware lest

our less assuming brethren of the drawing department, who have already appropriated the vital parts of solid geometry in the space conceptions of so-called descriptive geometry, do not take the substance and leave to us, teachers of mathematics, only the shadow.

Incidentally, some of this mathematics,—the trisection of an angle, for example, might be done in the graded schools. Be very sure that no one frighten you into thinking it is not mathematics, of the purest and simplest sort. The writer knows of no instance of an approximation process of the pure type which is so simple, indeed, as this one.

As another contrast to the fetish of the square root process, let us consider a rule for square root which is used frequently by carpenters and other mechanics. It is a perfectly pure approximation process, as is the usual square root process; it is not contained in any arithmetic with which I am acquainted; it is at least as simple as the usual process, though it is not so elegant; it possesses two enormous advantages: (1) any person can understand it at once; (2) no person can possibly forget it after he has worked as many as two problems with it. Yet the writer is convinced that it would be *tabooed*,—that it would not be accepted as an explanation of finding square roots on an examination paper, for example, by county or state examiners. It consists simply in dividing the number whose square root is to be found by a trial square root, which may be as bad a guess as you please. If the guess is too high, the quotient is smaller than the divisor, and vice-versa. If the guess is exactly right, one stops. If the divisor differs from the quotient, the guess was wrong; one then takes the *average* of these two numbers; this average is certainly a better approximation to the square root than either the first divisor or the first quotient. Taking the average thus found as a second approximation, one proceeds as before; and this process is repeated as often as necessary, until the quotient differs from the divisor by less than the desired error. The carpenter who used this rule knew all of this, even how to find his error; yet he was actually ashamed of having forgotten the *"mathematical"* process for square root! It seems to me that we ought to teach this rule in arithmetic, rather than the usual rule, for the students seldom understand the usual rule—that is the reason for it,—and they almost invariably forget it quickly. Or is the *taboo* too strong?

GRAPHICAL APPROXIMATIONS.

Finally, it is interesting to consider the approximation processes associated with graphical work in geometry and in algebra.

As an example, it is obvious that the solution of simultaneous equations by the drawing of the corresponding graphs—on larger and larger scale—is actually a pure approximation process. The prejudice against this process is passing away. It is the only really feasible process in many instances, at least for children, as witness the simultaneous quadratics, $x^2 + y = 7$, $y^2 + x = 11$. Curiously the old *taboo* against this process conflicts with

the *fetish* for the renowned Horner's process, since these two processes are absolutely identical in their essence.

In geometry the solution of triangles by means of actual construction of triangles with given parts and actual measurement of the unknown parts is a graphical approximation process. Some one may contend that this is trigonometry; yet a *very* delicate line must be drawn to exclude these problems from geometry, and if they do have the practical value of trigonometry, should we discriminate *against* them?

Passing over these special examples, let us consider the absolute necessity for graphical figures in order to make precise much which is at present hazy in elementary mathematics. Thus the figure for $y = x^2$, drawn by means of rational values of x, affords the only elementary means of really defining x^2 for irrational values of x. For theoretical purposes the requirement that the curve be continuous is absolutely sufficient to define, for example x^2, which was previously not defined.

Again the curve $x = 10^y$, drawn for rational values of y defines $y = \log x$ for all values of x if we merely require that the curve be continuous.

Thus the graph, often unjustly sneered at as "*only* an approximation" is clearly a means (in fact it is the only elementary means) of giving strictly accurate definition to the concepts like x^2 and log x which occur constantly in elementary mathematics. It is for this reason that the writer has especially emphasized this phase of the graph,—in order that the processes called graphical be recognized as purely mathematical processes, not only justifiable themselves, but, in point of fact, actually the only elementary means of justifying a large part of the work which is often presumed to have a certain mathematical superiority. This other work—work involving x^2, log x, axb in cases like $\sqrt{2} \times \sqrt{3}$, et cetera, is not only not superior in accuracy and precision from the highest theoretical standpoint; it is actually *dependent* for rigorous explanation on the concepts called graphical.

This is then another instance of fetish and taboo; fetish for a fallacious use of undefined operations like $\sqrt{2} \times \sqrt{3}$; taboo against the eminently justifiable and practical work in graphical representation.

CONCLUSION.

In a famous allegory, Ludwig Fulda has told of a king, who, hearing of the pretended ability of a sorcerer to make a garment which the wise could see, but which was invisible to knaves and fools, and believing that he must pretend to see this fabric in order that he be not esteemed a fool among a court of wise men, threw off his common garments and made public parade in the marvellous costume which the sorcerer constructed. Each citizen praised the wonderful beauty of the garments which he could not see, lest he be acknowledged a knave, till a peasant girl, ignorant of

the pretended qualities of the garment, exclaimed: "Why, the king has nothing on!"

This allegory applies no more keenly to the foibles of human vanity in alleged belief in popular theories and popular favorites, too often based only upon the fear of condemnation by superior judges, than it does to the curious traditional beliefs and traditional statements of our elementary instruction. Many a proof is hailed as a wonderful invention of the human mind, and accepted as genuine, which is in reality nothing but the veriest humbug. Many a homely process is cast aside because it is out of style rather than because it is not serviceable.

Let us beware of these false garments which our pride may dictate through our fear of exterior condemnation: the wonderful, mystical, mysterious theorems on limits and infinite series and incommensurable cases. Let us hold to the modest apparel, which, though lacking the attractive element of mystification to the uninitiated, does still possess the fundamental values of utility and certainty: the draughtsman's constructions in geometry, the carpenter's rule for square root, the easy trisection of an angle, and in general, each and all of those misjudged and unorthodox processes which are useful illustrations of that mighty principle of approximations which, though often despised, runs through the whole fabric of mathematical learning, and serves to unify and complete what would otherwise be a disjointed mass of uncompleted theories.

NECESSITY FOR A REVIEW OF ENGLISH GRAMMAR IN THE HIGH SCHOOL.

PROFESSOR ABAGAIL PEARCE, NORMAL COLLEGE.

The purpose of this paper is to voice a complaint made by teachers in secondary schools and colleges; to inquire into its causes, and, if possible, to suggest a remedy. I say, if possible, to suggest a remedy; for, although the complaint is universal, the disease has not yet been cured by any patent grammatical devices, nor has much beyond medicating the symptoms been done by diagrams, language lessons, composition, or grammar. In fact, in my opinion, "this kind goeth not out but by prayer and fasting,"—hence the violence of the possession.

But to the point! What is the greatest hindrance to effective teaching in secondary schools and colleges? Is it not the lack of analytical power on the part of the pupil? He can neither express his own thought with accuracy and clearness nor interpret the thought of others. High school teachers know and deplore this; but I shall confine the subject to the

experience and observation of the teachers of the Michigan State Normal College.

The teacher of mathematics finds the pupil unable to interpret the problem or theorem;—to quote from the pupil: "I could solve the problem or demonstrate the theorem if only I knew what the author means, what he is trying to get at." The teacher of Latin complains that the pupil cannot do good work in Latin, particularly in Latin prose, because he does not grasp the thought, owing to his inability to grasp the relations expressed by connectives,—prepositons, conjunctions, and relative pronouns especially. Then, too, he fails to appreciate the slight inflections still remaining in English; is very slow in the recognition of tenses; and has no feeling for relation and analogy. These are bona fide criticisms given by the teacher of the Latin department. The Head of the department went so far as to say: "Before I can teach Latin prose I have to teach English grammar." This after a high school course of four years, too! The teachers of the modern languages make the same criticisms. Pupils have to be instructed in English grammar before they are able to do even passable work in German or French prose. This is a sample of their reasoning—everything ending in "ing" is a participle. They have not grasped the idea that the function of the word or group of words determines its construction.

Every department complains of this lack of analytical power; but it is, perhaps, the teacher of English grammar who most keenly realizes this deficiency. Many of the pupils have not the slightest idea that the study of grammar is the study of language, of thought. It is one of the teachers' courses; therefore let it pass for a benefit. They have evidently *committed to memory* that a certain word is a certain part of speech, and *that* it is, no matter what the sense demands. They seem to have an idea that an invisible, unknowable, inexorable somebody has at some time ticketed every word and it *must,* perforce, always be put into that pigeon-hole, no matter if it has changed its meaning. Meaning! What has common sense to do with grammar, they virtually say and think!

With such an opinion, they make, as you know, the most absurd mistakes. Evidently they cannot, at least they do not, reason when given a puzzling sentence or even a simple one. Really it is amusing to hear them interpret the sentence: "On him, their *second* Providence, they hung"—subject "they," verb "hung," object "Providence"; and when I mildly remonstrate saying there is no reason for hanging Providence, they look dazed. One actually said: "But this is grammar, you know, and Providence *must* be the object,—what else could it be?"

Besides this lack of reasoning they seem to have no accurate idea of the meaning of words, no feeling for words or their correct use, no accurate knowledge of the forms of words. The teacher of Domestic Science tells me many of the specialists, in writing up their recipes, write of beating up the "y-o-k-e" of an egg, or describe the "bo-a-r-d-e-r" of their bordered slippers. They could surely get these words and word forms in the grades

and might better than commit so-called grammar. I shall never forget my breathlessness at an answer a senior once gave. She read from "Julius Cæsar"—"Doth not Brutus *bootless kneel?*" Puzzled by her rendering, I ventured to inquire the meaning of *bootless.* Triumphantly she replied, "Why, I suppose without his boots on." Last semester, in a high school not far away, the teacher of "Ivanhoe" was surprised to learn that "a friar was half a monk and half a man and lived in an alley." Passing over the suggestion that possibly she may have hit upon the truth—what kind of reasoning, inductive or deductive, evolved that answer? Again, you recall the sentence: "They made the welkin ring with shouts of victory." This was analyzed by a member of the teachers' grammar class: subject, "they," verb "made," object "ring," modified by the adjectives "the" and "welkin." In response to, *what* did they make? the answer was "ring"—"the welkin ring." What kind of a ring?—"a *welkin* ring." What kind of a ring is a *welkin* ring?—*"a magic ring,"* of course. Well, how did they make this magic ring with shouts of victory? "That is the only thing about it I could not understand, Miss D——," was the reply. Another sentence that puzzles nine-tenths of the pupils is: "Be aye sticking in a tree, Jack; it'll be growing, while ye're sleeping." The usual analysis is: subject "you" understood, verb "be sticking," modified by the phrase, "in a tree";—no wonder they fail to perceive what this lofty position has to do with the remainder of the sentence "it'll be growing, while ye're sleeping."

You remember in Lowell's "Commemoration Ode," in speaking of the inspiration the world might gain from the memory of the brave deeds of the young heroes of Harvard who gave their lives for their country, he asks: "But is there hope to save even this ethereal essence from the grave?"

A pupil interpreted the thought: "But is there hope to save even this 'spiritual scent' from the grave?" When asked what a "spiritual scent" was, she replied, "why, a spiritual perfume." Her lack was due not so much to an incorrect analysis of the sentence as to lack of any ordered idea whatever of the relation of ideas and how these are expressed in words.

Here is another example, showing incorrect analysis as well. In the poem "The Huskers," by Whittier, you remember in describing the evening scene he writes:

> "Swung o'er the heaped-up harvest, from pitchforks in the mow
> Shone dimly down the lanterns on the pleasant scene below."

One interpreted this that the people present were "swung o'er the heaped-up harvest, from pitchforks in the mow." You get the picture—the huskers swung "from pitchforks in the mow." This indicates that the imagination as well as the analytical faculty needed training.

But open the stores of your own experience and say whether I have given isolated cases or exaggerated the lack of anlytical power on the part of the pupil. Eliminating the few who are hopeless, or, to paraphrase Emerson, might understand the cry of "fire" or of "pitchforks," but who never

can understand anything figurative or complex, there still remains the majority of our pupils, for whose benefit this question should be considered.

Since this is true, what are the causes? Doubtless they are many. Chief among them might be enumerated: no sense for the correct form of words, no accurate knowledge of the meanings of words, and, therefore, of their correct use; not only no power to see the relation and connection of the words and groups of words, but also no adequate idea of the relations of words to thought. With all this, too, they do not get sufficient practice in studying out carefully the meaning of sentences. The Committee of Ten, you recall, took the ground that less time should be given to formal grammar in the high school; but, on the other hand, recommended that this analytical insight into language should be given through literature and other subjects. If this suggestion were followed, perhaps it would meet all requirements. That it is *not* carried out, we all know. Every teacher is so busy with the subject matter of his *own* particular branch of thought that he is obliged, to a great extent, to let those who can "work out their own salvation with fear and trembling," and let whatever will take the weak and hindermost.

Therefore, since this training in the analysis of thought *is* not, and perhaps *cannot* be given in other subjects—would not a rigid course in English grammar in the high school at least make a beginning in the right direction? Would this not be *one* way and a good one to correct illogical thinking and, consequently, illogical speaking and writing? They are faulty not only in interpretation of thought but also in written expression. Why is it that at least one-fourth of college students do not express their thought in complete sentences? It cannot be lack of practice in writing, when we consider the time spent on this in the lower and grammar grades. Why are so many essays returned with the criticism "faulty construction"? Pupils write a sentence which is not an exclamation, with no verb, or have a dependent clause standing by itself. You know how common these mistakes are. What is the cause? Is it not possible that this is due to their lack of analytical training? Would a course in grammatical analysis, in which the pupils would be obliged to think out the whole sentence logically from beginning to end, help them in written expression? I believe it would; and certainly it is worth trying since we have failed in getting good results even by continuous practice.

Consider what is the consensus of opinion on grammar as an aid to logical thinking. Pardon me for the reminder—but what study did the Committee of Fifteen recommend as "the disciplinary study par excellence"? Was it not Grammar, because *objectively* it reveals "the essential nature of thought itself, the most important of all objects because it is self object"; while *subjectively* "grammar demonstrates its title to the first place by its use as a discipline in subtle analysis, in logical division and classification, in the art of questioning, and in the mental accomplishments of making exact definitons." These are the points the *best* are deficient in:—*subtle analysis,*

yes, even the simplest analysis; logical division and classification,—which one does not need this? the art of questioning and the mental accomplishment of making exact definitions,—what could be done in every line of study with such pupils! I am very fond of that terse statement of Professor Hinsdale's—that "grammatical facts are mental facts." Think of the disciplinary value of a subject like this!—Mastering *it,* the pupil is mastering all subjects of thought. I remember hearing the President of our College say in faculty meeting that there was no doubt in his mind that the study the pupils in the Michigan State Normal College need most is the study of English grammar. Why?—you may ask. Is it not that they may be able to find the thought expressed in words; that their minds may be trained to analyze thought by analyzing the sentence?

As teachers of all subjects we cannot emphasize too much the statement of Mr. S. S. Laurie:—"A boy who is intelligently analyzing language is analyzing the processes of thought, and is a logician without knowing it. And that is the reason why the study of language has always been regarded as the best preparation for the logician and philosopher. Hence, too, it is the best preparation for the study of *all* or *any* of the sciences." Professor Tyndall once said: "If I except discussions on the comparative merits of Popery and Protestantism, English grammar was the most important discipline of my boyhood." But why make more quotations? We are all agreed, no doubt, on the value of grammar as a disciplinary study—a study that trains the mind for the understanding of all subjects.

Since this subject is of so much importance, where shall it receive attention? It is hard to teach and study for two reasons: it is abstruse—the beginning of logic, though elementary; and, out of this grows the second reason—it requires a certain maturity of mind on the part of the pupil. These two considerations force us to say that the main part of the work should be done in the high school when the pupil is better prepared for such study. He should get in the grammar grades perhaps the following points: —parts of speech and their use, inflections, etymology, and also a training in analyzing sentences as difficult as he can grasp at that age. No idioms, no anomalous constructions should be given; but straightforward sentences which, however, require reasoning to get at their meaning. Let him begin the training of his analytical faculty on thought expressed in language. Then in the high school he can carry this on in *all subjects,*—provided he is shown *how* by having a definite time given to anlyzing sentences, increasing in difficulty and abstruseness. Remember he is not wasting his time: for "grammatical facts are mental facts"—that is, he is not studying grammar *alone* when he is being trained to analyze thought but he is laying a sound basis for all subjects; for the teaching of grammar "must be a vital factor" not only "in English as a whole" but also in teaching all other subjects.

But in what year in the high school should grammar be studied? For some reasons, I should favor the eleventh, or better, the twelfth year; but

for the sake of the benefit gained for other subjects it might be given in the tenth year. *Whenever* studied it needs to be more than a so-called "rapid review." Remember the mistakes quoted were made by graduates of high schools, studying in the Normal, therefore *they* needed more than a six or ten weeks' review of grammar. I find by actual count about half of the pupils in the Teachers' Grammar in our College have not studied grammar since they left the seventh or eighth grade; others have had the rapid review—so rapid it seems to have disturbed the equilibrium of their grammatical brains, to judge by the fearful and awful results. (I am using these words accurately and advisedly.)

But, you object, the practical question is how to get time for a good course in English grammar in the high school. This is not my problem, but yours. In view of the time saved in other subjects by this drill, would not time spent here be time saved ever afterward in all mental work? Could not some work be done earlier? Some have suggested putting the study of Latin and other formal languages early in the grades. That is all very well, but not a substitute for English grammar, nor does it teach English grammar. It has been proved, I think, that the best approach to English grammar is not through Latin. Remember graduates of the high schools, many even who have had four years of Latin, have to be taught English grammar before they can satisfy the Latin department. Personally I should favor beginning the foreign languages early because *then* is the time to commit forms, etc.; but be sure it never takes the place of reasoning, and cannot. Why not, however, learn something of the meanings of words in the *English* language?—the difference between "yoke" and yolk, for example; I know spelling is old-fashioned, but I wonder if some drill in spelling given early might not help in the later work of interpretation. I know an inteligent study of words—etymology, etc., would be of infinite benefit, and why not study English words early as well as Latin forms? Pupils can reason but little until the seventh or eighth grade. Why not then give them correct word-forms with meanings, and inculcate a desire to get the best word? Train their sense and feeling for words, have them take pride as far as possible in the right word in the right place.

But aside from the benefit that a thorough course in English grammar would be to those entering and continuing their studies, there is another great advantage in this course. Many of the high school pupils leave school altogether at the end of the four years' work. Where, then, will they get this formal analytical training? Have we been fair to send them out into logical human life without this power to see things in their logical relation and connection? Have we done the best for them, either to fit them to hold their place in a world governed by the laws of cause and effect, or to enable them to assimilate the best in literature for their delight and culture? It seems to me we have not. Then, too, there is this other question. Many of our rural school teachers are the graduates of high schools only. Without this high school drill, what kind of teaching of grammar have we?

Just the kind that results in the poor work complained of. In fact, many, if not the greater number of those entering our colleges and universities have been taught grammar by high school graduates only. You know what happens when the blind lead the blind. For this one reason alone; namely, to fit the rural teachers to teach grammar at least understandingly and effectively, every high school should give adequate time to grammar, and by grammar I mean the intelligent study of thought and thought processes. The composition work could be fitted in as a part of the grammar. Heretofore, to be sure, they have written and written, but now let them write paragraphs, paying particular attention to what will train their logical power,—unity, coherence, proportion. In this way, too, the logic of the sentence could be emphasized. One fact would follow another and the pupil would think logically, therefore write clearly and accurately. Why not teach them that their common sense is one of their most valuable assets in interpreting thought?

But what should this high school course include? In the main the time should be spent in analysis; idioms should be introduced; anomalous constructions studied with such light as historical English might throw upon them. Some time might be devoted to the history of common constructions in some such book, for instance, as Kellner's "Historical Outlines of English Syntax," or Abbott's "How to Parse."

I was much interested several years ago to find that Thomas Jefferson claimed that the English student especially needed the drill in the history and grammar of his mother tongue, in order to understand modern English aright. He wrote that he was obliged "to recur to Old English for the explanation of a number of law terms, and argued that an acquaintance therewith is of especial value to lawyers!" If lawyers need it, certainly plain, literal people do.

But, remembering that I do not claim that grammar is *the* remedy and the *only* one for illogical thinking, enough has been said to show my reasons for thinking that English grammar should have an important place in the high school. It would fit for higher work in colleges and universities, not only along the line of English but in all other studies; it would be a simple matter of justice to our rural schools to give them teachers of grammar who know something of the subject themselves; it would be a beginning in analytical training for those whose education ends with the high school; and it would certainly be an important factor in training one to reason clearly, soundly, and progressively, and to express abstract thought in clear-cut, concrete form by means of English—the Mother Tongue—than which no tongue is more composite, more flexible, more capable of conveying not only all that the human reason may hope to attain, but also the deepest feelings of the human heart.

ENGLISH CONFERENCE

SOME PROBLEMS AND POSSIBILITIES IN THE TEACHING OF ENGLISH GRAMMAR.

MISS JESSIE S. GREGG, KALAMAZOO.

Several years ago, when I was teaching in the High School at Flint, a case which aroused general attention was being tried at the Court House A well-known business man of the town, then a merchant, but formerly a fire insurance agent, was being tried for setting fire to several buildings insured in the company which he had formerly represented. At the trial one Saturday afternoon when I was present, a woman witness was being questioned by the prosecuting attorney. The gist of the first questions and answers was that on the evening of the fire in question she had seen the accused hurrying along Main Street. Then the prosecutor asked the witness this question: "Was he carrying anything?" "Yes, sir, he had some bundles under his arm," was the reply. The attorney thought a moment and then said, "Bundles, or a bundle?" "Bundles," she answered indignantly. "But you swore in the court below that he had a bundle under his arm. I can show you the records." "Do you think I'd believe your old records?" she retorted. "And besides that, if I want to say *bundle,* I say *bundle;* but if I want to emphasize it, I add s and say *bundles.*"

I should like to be understood as not presuming to say anything new on the subject of English grammar; but to some things of which we have record, I want you to let me add *s* merely to emphasize them.

With regard to every subject which we deem worthy of being taught, as necessary for the child's normal growth and life in the world, the teacher's business is three-fold: First, he must be convinced that the branch of knowledge which he teaches has some real place in the child's education and development; Second, he should know as exactly as possible what that place—its relation to the child and to the whole system or plan of his education—is; Third, he must give this knowledge to the child by adequate means.

I think that most teachers of English have definite notion of the place and value of literature study, of oral and written expression of ideas, in attaining the large ends of education; and in the last few years, under the inspiration and help of live and thoughtful masters in these subjects, we have gone forward in working out new and helpful devices in giving the student knowledge and training through these which he needs in his life. We have seen the need of getting away, especially in teaching younger people, from the old methods of engrafting upon them knowledge in the form

of fixed rules, definitions, and directions; we have led, rather than driven the child to get for himself a training which he needs.

I am not so sure that we have had this "new birth" in the teaching of English grammar. We are so well pleased—and naturally—with our success in securing the desire of the student to express himself, that when the exercise is written or spoken, and really in content, idea, attains even more than we expected, we coldly write in the margin of the theme at several points—"G-r-a-m.," or say, if the exercise is oral, "Your grammar needs attention," assuming that matters of grammar are already fixed in the mind of the student, and that there is nothing for us to teach on this subject. Perhaps there should not be by the ninth grade, but too often there is; and I am beginning to feel that if there are these grammatical shortcomings, now, if we have not done it before, is the time to make the same new efforts to help in matters of grammar that we are making in the teaching of the other branches of English,—in composition, reading, literature.

In the first year that I taught, my assignment of work included a class in ninth grade grammar. I was, like most teachers in this first year of teaching, full of enthusiasm for my work in composition and literature. Fresh from those helpful and inspiring courses at the University, I was eager to try the plans I had been given and to invent new ones for reaching some definite results in English teaching. But I will say to you frankly that I had not the faintest notion that there was any new way to enliven the teaching of grammar; or that a new attitude was possible. I used the book provided by the school, did exactly what the exercises directed, and without expressing the idea, even to myself. I think I looked upon the teaching of English grammar as the same thing that it had been when I studied it fifteen years before. I think I taught it very much as I had learned it. If I thought of its place among English studies, I deemed it a respected and time-honored English-curriculum-relic, or as a subject that should now be taught only when need arose for it,—a medicine to be taken sometimes when ailment required it. Except in serious cases the disease would take care of itself.

Perhaps you would say that this attitude is still the right one. Grammar *should* be given only as it is especially needed to heal or cure the particular English disease in the student to which it ministers. But I think we have found that a lack of knowledge of grammar as shown in speech and writing is so common and so prevalent, and the criticism from the Latin teachers of the English grammar shortcomings of their students is so frequent, that we may say that this disease is practically a chronic one; and is best helped by a grammar tonic, given somewhat regularly; and made not bitter and black and thick, but like all successful modern remedies, made with a pleasant taste, administered in comfortable doses, and productive of a soothing effect.

Indeed, I think we should find among teachers, these three positions

concerning the subject: (1) The unreasoned position which regards English grammar as one of my ninth grade boys did when he answered my question as to the use of a knowledge of grammar, thus: "Why is grammar a chief study in the Public Schools, if it is unworthy of study? Why have men devoted their whole lives to perfect books in which is given the essentials of grammar? Supposing that you were the President of the United States and were called upon the platform of a public place for a speech, and you were not educated? Would it make you feel nice to say 'ain't,' or 'don't' for 'doesn't'? Do you think the people would be proud of their President, or would enjoy listening to your speech?" In this view, grammar is a subject that has been with us for a long time; there are many grammar texts; it gives presidents directions how to speak correctly. We must continue to teach it. (2) The half-reasoned view, which says that there are other phases of English study—rhetoric, composition, literature, criticism—larger in their ends (and perhaps including in slight way grammar, the "mere mechanics of language"); that matters of grammar may even take care of themselves; at most, they need be considered for each individual, or for small groups of individuals. (3) The position that recognizes from teaching experience and natural conditions the need for greater emphasis on, or revised methods in teaching this time-honored subject, and holds that the subject though old, may, when taught, be taken out of its old mould and shaped anew.

By saying so much of grammar, I would not overrate, or exalt this phase of English over the others; I would merely have us reminded of its place in the whole system of instruction. Now, let us see whether we have the same fundamental conception of the nature of grammar, and the place in the education of an individual which it fills.

In an address before the Modern Language Association in 1905, Professor Francis H. Blackburn, in the course of a plea for the cultivation in school of oral speech, points out that there are two distinct things in the mastery of any language: "First, understanding it; the ability to recognize its words and phrases when they are spoken by another, and to connect with them the meanings which they conventionally carry. Second: speaking it; the skill required to utter its words, and a knowledge of their meanings, so that the speaker may convey his ideas to others. Thus the learning of a language from the beginning calls for two things: the memorizing of facts, and the gaining of skill through practice. To these two, as a corollary, there is to be added a knowledge of the grammar of the language, *i. e.*, familiarity with the laws of usage that fix the way of putting words together in connected speech. How much of this is necessary depends on the language concerned; often, as in English, sense may be conveyed despite violation of these laws, yet one who fails to observe them would not be called a master of the language."

To this explanation of grammar as related to language which I quote from Professor Blackburn, should be considered as background Hegel's

view of the whole system of instruction as related to the individual mind's ultimate goal. I summarize from "Hegel's Educational Ideas," by William M. Bryant:

"Education is to be looked at objectively as the system of helps by which the individual mind is enabled to rise from the helplessness of infancy to the independence characterizing true self-conscious existence. On the other hand, from the subjective point of view, it is to be regarded as just the process itself through which the individual mind advances from infancy to maturity as mind.

"As to means of instruction in general these may be said to consist of subject matter properly arranged (course of study) and of the appliances for rendering this effective (text-book and apparatus). Briefly stated, the former head, in merely its immediate objective aspect of education, presents three phases: (1) Language, as expressive of thought relations; (2) Form, as expressing space-relations; (3) Process, as expressing relations of energy."

It is with the first division that we are concerned. "Language," he says, "is the most universal and adequate form in which the thought aspect of consciousness finds expression. It is in language that the universal characteristics of mind find their subtlest, most exact, and most adequate formulation. Thus, language is not only the earliest subject matter, but the predominating medium of education; it is, from kindergarten on, the most direct, and the absolutely indispensable medium. All other appliances find their highest value in this: that the knowledge of them is raised to its highest terms through description of them in words, through command of them rendered exact by explanation of the relation of part to part in words, through appreciation of their uses; such appreciation becoming really matured only through tracing out by means of words the actual purposes which such appliances are intended to fulfill.

"But not only is this true from the point of view of the teacher, who must consider the appliances appropriate to the work of education. It is no less true in the actual development of the mind of the individual pupil. And because rational education consists in the unfolding of the individual mind in accordance with the universal type of mind, it may well be presumed that in the teaching of language, the process is essentially one of leading the individual pupil to recognize with ever-increasing clearness the universal character of language, and of thought as embodied therein. And this is only so much the more evident when we remember that it is in and through language that the typical or universal characteristics of mind find their subtlest, most exact and most adequate formulation. . . .

"In this respect, the special phases which are of direct practical interest to teachers are: (1) Voice, (2) Reading, (3) Writing, and (4) Grammar."

Hegel's explanation of the first of these divisions is suggested by the formula: "What the individual is, he infuses into his voice . . . In this

elementary beginning of language the child attains to the stage of articulate utterance through imitation—unreflecting, spontaneous. As the child enters school, his vocabulary consists of words as wholes. Each sentence is to him, a whole, the construction of which is not even a mystery to him. He has not strictly speaking learned language, seeing that no one has actually taught him. He has learned to speak by being placed in human association. Thus the first epoch in this development of individual self-consciousness, consisting in the spontaneous unfolding of a vocabulary to meet the ordinary needs of human association, still involves a synthetic process and corresponding product of the nature of which the child is unconscious.

"Of the product, he begins the analysis as soon as he enters upon school life. And in order to do this he must be brought into direct relation with language in a new form. Reading constitutes this new form and involves the first stage in the analytical examination of language as the outer, organic form of thought. The first stage of his reflective activity in school will consist normally of the formal analysis of the elements of this vocabulary under the guidance of the teacher."

Next, "Writing is the complementary constructive process of the book read. Writing is production; reading is interpretation and reproduction. Even yet, all language work is still relatively spontaneous. It is indispensable that it should be supplemented by the science of language, grammar, the instrument of reasoned criticism, of judgment in the form of reflection." Hegel declares that "the value of grammatical study cannot be too much emphasized, since it constitutes the beginning of logical culture. Through instruction in grammar children are brought to attend unawares to the distinctions of thought. Herein is involved the process of the examination of thought by itself in the direct apprehension of the simple natural categories under which all thought-forms are primarily to be classified, and through the application of which all thought-processes are to be clarified, corrected, and matured. It is precisely this process which in its elementary form constitutes the essence of grammar, and the application of which constitutes the grammatical analysis. Once clearly understood, it appears as self-evident that this is one of the most valid and valuable of all educational media."

I quote at such length to freshen our minds as to the place which grammar logically holds in a system of instruction which is based on the needs of the individual in normal growth. To know this, and next to be convinced, as a result, of the need of aiding the pupil in his development, I stated as the business of the teacher. Her next problem is, How give the student this knowledge?

At the heart of grammar teaching there is "the fundamental principle of all pedagogy, which is summed up in the one word 'interest.' The teacher must be interested in his subject, the student in his work; for

without these the teacher cannot teach and the student will not study. . . . The second often has to be created." In the teaching of grammar, perhaps more than in any other subject, should this principle work.

Is it possible to have and to create interest in such a subject? Let us try at least. I think the child has a right to know what the study of grammar is and why he studies it; he will not understand all that you may tell him of its nature, and use to him, because, as psychologists tell us, boys and girls are not thinking much at this time. But even to check his stream of non-thinking (if he does not think) by the explanation, may do no harm and be worth while. My students in the ninth grade when they enter the high school have a curious notion of grammar. I asked of seventy-five students the questions suggested in "Exercises for Grammar Review" prefaced to Scott and Denney's "Elementary English Composition" with these general results: As to the time of beginning the study of grammar, they do not agree, for they do not distinguish between technical grammar and the other phases of English; students from the same school do not give the same report of the time of beginning the study. Their answers vary therefore, from the 4th to the 7th grade. They tell me that the first lessons had to do with parts of speech, story-telling, letter-writing, sentences. In the majority of answers by far, all disliked rules, which they were generally agreed grammar was made up of largely; and though they said it was made up of rules, many could not give one. They liked the parts that involved working out something, doing something,—analyzing, parsing, diagramming, sentence-building, story-writing, letter-writing. This answer suggests something for us. We must let the student work out his own rules. He will like these rules if he makes them, and he will know them because he has worked them out.

Nearly all were agreed that the study of grammar was important, useful. Said one, "Grammar helps people to talk, read, and write correctly, and I think it is of great benefit to everybody. I advise a person to study grammar because if he could speak correct English *he might some day be able to teach and earn a great deal of money"!* But curiously, in answer to the question, "Can you name any particular occasion when a knowledge of grammar was a help to you?" few could or did. One girl *did* recall that a knowledge of grammar was once a help to her "in speaking with the eighth grade teachers and the Preceptress of the High School at the February luncheon which the cooking classes gave." I could derive from the answer as to the choice of arithmetic or grammar that they could see at once the practical and particular value of arithmetic. They saw quickly that a girl in a store would need to add up sales, compute, count the week's pay, etc. But few saw that she would need to speak correctly. One student did. He wrote: "The clerk has to figure when making sales, but she must *talk good* in order to sell the goods." Usually they thought of grammar as a study useful in school, but not in life. Should we not

show them that a knowledge of grammar is practical, may be used at the same time that it is cultural, or scientific?

I would not take all my time telling the whys of grammar, but it does seem worth while to put the pupil's mind in a receptive mood for it. Then, too, if he is to learn something exactly, he will do it intelligently only as he knows the significance of what he is learning. Some of my students looked genuinely interested when I told them, for example, *why* we learned the forms of pronouns. (Can you not remember when you learned: "Nominative, I; Possessive, my or mine; Objective, me; Plural Nominative, we; Possessive, our, ours; Objective, us" without having an idea why?) First, I brought out by questions the fact that English nouns do not change form except for the possessive case. Then I said: "Give a sentence in which 'I,' person speaking, has objective use? Give one using the same pronoun in the possessive case. Give another using the same person-pronoun in plural cases." From the sentences with the pronoun forms used naturally in them, they were led to see the logic of "Nom. I, Poss. my, Obj. me, etc."

Next, in the matter of trying to interest students in this subject, I think teachers sometimes lose sight of the fact that the nature and history of our language, which is the content of grammar, is really interesting. There is opportunity here to give the student a simple story of the origin and growth of language from signs to spoken words. That story can be made an interesting one, by simple explanation and illustration. Then, there is the story of the making of modern English grammar—how any why our language got rid of all that multitude of grammatical forms which we had in Old English, and the new grammatical machinery, that the language has acquired during the last thousand years; and how it was obtained. Tell him the history of that troublesome possessive case: The word *horses,* in early English, has nothing to show whether it is a genitive singular, or a nominative, an accusative, or a genitive plural. Today this is a defect (ambigious form) in spoken discourse. In written discourse the modern device, the apostrophe, helps. Thus: singular possessive, *horse's;* plural, *horses;* plural possessive, *horses'*.

In the same connection give him as introduction to the study of English grammar a simple account of our English language, like that one in "A Modern English Grammar" by Mr. Buehler. Children in the grammar school grades can appreciate parts of this, if not all, and will like it. You may recall that Mr. Buehler tells first why our language is called English; then, of the early home of the people of this name, with maps showing first this home land, and next indicating the spread of the English language. He presents a table showing how far English has outstripped other languages, by giving for 1890, the number of people speaking English, German, Russian, French, Spanish, Italian, and Portuguese. Next he points out the difference between Modern and Old English with some simple illustrations, and shows how our language has grown from a 2,000 word

vocabulary when it was carried to England to a more than 200,000 word language by the addition of words from other languages and the coining of new words. He marks briefly the language changes between 1100 and 1500, and reminds us that the language is still subject to change. All of this arouses interest in the background and subject matter of this grammar, itself, which we must now teach the student.

What of the subject matter in the texts? "Grammar," according to one text, chosen at random, "is an account of the relations which words bear to one another when they are put together in sentences." Further, "The proper starting point of English grammar is the sentence; it is not by grammar that we learn to speak and write, but the object of this study is to learn the uses of words in sentences, so that we may test the habits of speech already acquired and make them conform to the best models."

In teaching the subject, we shall do well to emphasize more strongly than does this definition, the fact that words have relations to ideas and to the communication of ideas; that a sentence is not a dead, artificial, ready-made, "words-put-together" thing, whose elements we merely take apart and classify. Sentences are expressions of ideas, and grow or become by laws and principles. And because the course of language development has fixed certain laws of usage, made standard certain ways of putting words together in connected speech, the problem in teaching grammar is to present to the student these laws with the large, social aspect in view—if I may use the term—in which the study of the whole subject of English is being regarded and taught. Language as a vital medium of self-expression and communication between men, gives rise to an interpretation of laws of usage which language as simply spoken or written words in various combinations, has not. Many grammar texts deal with words, phrases even sentences, as only mechanically related elements. In this method students easily miss the underlying reality behind the analysis.

The method, as I have said, of a large number of the books and thus the teaching, is to have the child first learn the laws of usage as they have been formulated in definitions and rules; and after some illustration from material in the book, it is assumed that he will apply them in his own speech. You remember how we learned first of all that there were eight parts of speech (what "parts of speech" actually meant we may not have known then); that a noun was "the name of something," and that a verb "was a word which expressed action, being, or state of being." If you have forgotten how little this last definition meant to you when you learned it, verify history by asking the child who has learned it without your explanation to write the definition on the board, and to tell you what it means. Perhaps the brighter students can make a guess, but the others will write it: "A verb is a word which expresses *action being, or state, of (or 'or') being.*" I have discovered by questions that though the child learned that definition some time before he came to the high school, its meaning is often far from him. No wonder he cannot tell the verbs,—the action words—

from the nouns, or the adjectives, or the adverbs. Next after these definitions or along with them we were asked to pick out nouns or verbs or other parts of speech from a certain piece of discourse; or a complex sentence was defined, then the student was asked to make one, or to pick out this kind of sentence from a group.

Would it not be much more logical, first to carry the child through the process of growth from a word perhaps, or a single statement to the sentence which is complex? Or still better, show him first what idea, or what situation is expressed by a single independent statement, and then what different idea or situation can be expressed by the sentence form which has been called complex? So in distinguishing between statement and question, instead of giving first the definition of each and then examples, ask the student to put into proper word association this situation, or idea, or that one. Thus grammar is made to be a study of these things in such a way as to let the student feel that he is working out that account. He is discovering these laws, formulating them, and so he makes grammar for himself. Many of you know the plan of the "Grammar Review" already referred to, prefaced to Scott and Denney's "Elementary English Composition" and of the Scott and Buck Grammar. The manner of presentation in these books, especially in the "Grammar Review," is to do what I have suggested—to let the student live out, or work out his own grammatical conclusions. I am, to be sure, reminded sometimes by my friends that just as good, old-fashioned spelling methods produced good spellers among our older generation, so the study of the old grammars in the manner current twenty-five years ago has fixed for some people laws of usage. Yet must we not say that it was rather the greater time and the more practice both in spelling and grammar which laid for them the foundation better? Given the newer method, plus the practice and time of the old days, we should do wonders.

I said that devices of the teacher should be used to make matter of grammer "play," as they do composition. It is true in the teaching of any subject, there are always those students who will master it because of their nature, or habit, or of both. There are students (a few) in every class who will master the old grammar taught in the old way. But a large majority, I have found, will not get the necessary knowledge thus. Some plan or device on the part of the teacher must be used to reach this number who are capable but who do not get knowledge by the direct-transmission-study-way. Let me illustrate my point by a device in teaching "parts of speech." But first let me quote from the first paragraph of a well-known grammar: "The word *'dog,'* when heard or seen, instantly creates in the mind a mental picture of a well-known animal." Does it? May we be sure that it does? Similarly he might say: The word *"run"* when heard or seen suggests to the mind a certain well-known activity. But suppose we say or call out this word in a company of onlookers at a baseball game or to a boy whose mind is on his team. Will they recognize the action

word, or the name word? Thus the image suggested by a word depends upon the actual situation. So the question should not be: What kind of word is *"run,"* or *"dog?"* but, what kind of word is used to stand for this thing, this action, this situation? To re-define: A word is a noun when its use in relation to other words of the expressed thought is to name some thing for us. Again in the grammar referred to, after a noun is defined, the word *man,* standing alone, and detached, is named as a noun, and so is *tree.* Yet if the child thought this: "The captain will *man* his boat well," or "The cat will *tree* her victim," what then? Still you will say: "These words, *'man'* and *'tree,'* are usually nouns." But similarly *"run"* is usually a verb, yet how common is the use: "The player made a good *run";* "The conductor has a day *run."* In this last sentence the word *"day"* we have all found will be called by five out of ten students, a noun, and with some reason. For isn't *"day"* to them our name word for a time period of twenty-four hours? Again, the word *"home"* is for most students a name word, put it where you will in a sentence or paragraph. In the *"home*-coming of Ulysses," "I went *home,"* it is still with them, a noun. A word like *"escape"* which is most commonly a verb is always a verb. I tried this passage: "A vizier who had displeased the Sultan was condemned to be imprisoned for life in a high tower from which *escape* seemed impossible." *"Escape,"* by nearly all, was classified as verb.

But now, take any group of students from your classes who will admit that they cannot distinguish parts of speech after having had grammar in one or two grades; or better, find out by indirect questioning what students are still confused upon this point, and see what you can do in one teaching period by this device, suggested by the "Grammar Review" and modified slightly to suit my purpose. It happens that Kalamazoo is a city of paper mills, so this analogy is local, as it should be, to appeal to the student. You will probably find one better suited to your purpose. I say to the class: "If we go over to one of the paper mills, and see the mill in operation, we discover that the entire working of the mill involves many different kinds of work, and groups of workmen. Perhaps in our visit we go first to the offices to get permission to see the mill. Here there are bookkeepers, stenographers, clerks. Then going out to the beginning of paper-making there are many people sorting paper and rags. Following the process, we find machinists, finishers, millwrights, calendar-men, cutters, trimmers, machine-tenders, engineers and helpers, washermen, bleachmen, duster-men, roustabouts, watchmen, superintendent. Now if we could look at the pay-roll of the mill we should see how the kinds of workers are grouped as Office Force, Finishing Room, Beatermen, Machine Room, Rag Room. Thus each man or woman is classed according to the work he or she does here at this mill."

In a similar way different words work in expressing thought. Let us try to classify our words; let us group together under one list all words

that do the same work. Never mind the names at present, we'll name each according to work done in the sentence or paragraph in which it is used. Now, of course, the first year high school student has some preconceived ideas of the eight parts of speech and he uses the terms of his previous knowledge. But where the old knowledge is confused, he can now see more clearly. We may also ask: "How does it happen that there are *eight* parts of speech, not *seven* or *nine?*" "Because it seems there are just eight kinds of work to be done." But if we can show that there are more kinds of work to be done by words than eight, we shall have discovered a new class of words or parts of speech. If we can show that prepositions and conjunctions work alike, grammarians must let us class them together." Now they are interested to see whether we can find a word that does new work; or to show just how the work of the preposition is not like that of the conjunction. It is easy to see how pronouns take the place of nouns; how adjectives qualify nouns, adverbs qualify verbs, etc.

It would not be difficult (or would you see objection to it?) with younger students to carry the mill-analogy further. To help the memory, let the names of the workers at the mill be associated with the work which each kind of word does. A "finisher," the man who puts the gloss to the crude or plain paper, might be the adjective, which adds a new touch to the noun. Or, might the "cutters," the men who reduce the long strips to smaller pieces be the adjective, which being placed before a noun, reduces the larger meaning? For example, *"apple"* names the entire class of fruit; *"red apple,"* a smaller class of the same. "Watchmen," who look after the general welfare of the entire plant might be verbs. The "helpers" at the mill are often substitutes for the regular men;—pronouns, perhaps. Very significantly, the "roustabout," the man who does various work, among words, is such a word as *"that,"* doing now one kind of work—pronoun; now another—adjective; still another—conjunction. If there were a class of men who did two kinds of work at the same time, and such a class could be found, I am sure, by a more careful investigation of my illustration, then we have an analogy to the possessive pronoun. It would be easy to single out a kind of work at the mill which would be analogous to the work of the conjunction in the sentence or paragraph. A superintendent or overseer has in mind the process as a whole and so relates and keeps all working together and joined in one. Thus the conjunction. If out of the whole system you could pick out the men who seem to be most essential in the paper-making, as the noun and verb are essential to each sentence or complete statement, another matter could be fixed. Of course one would not carry the analogy too far, nor make too much of it or it might become what the diagram has become sometimes—at first a frame whose only reason for being was the picture; afterward that to which all pictures must fit themselves.

Yet with our best efforts there are still problems. The *ing* words, derived from verbs, but adjective or noun in use, give trouble, so we must

find some device or analogy to clear up this uncertainty. Sometimes we can show this adjective relation of *ing* words by placing the expression before the noun, as: The "bitterly weeping wife." "The boy running down the street" is equivalent to "the running-down-the-street boy." Another way of helping this matter might be to explain thus: These *ing* words are like the little pointed pieces of wood which you would never call "wood" if I asked you what they were. You would say "tooth-picks," because that is their use. You name them according to their use, not their source, or what they are made of, or what they came from. Now if we can show students how these words are actually used—as name words, or modifiers—they may be able to classify them.

The words *have, had, may, can,* puzzle students. They call them adverbs. It is difficult to lead them away from this. If we have made the point that words that qualify, or modify action words are adverbs, they call *"have"* in: "I *have seen* a robin this week," an adverb. Are there not some ways to clear up this point—provided our present disposition of the words is the true one? They will still ask if the adverb which adds something to an adjective or to another adverb is not different from the word that qualifies a verb. Thus in: "The magpie chirps noisily," *"noisily"* is a genuine adverb. In "John had a red apple," *"red"* is a true adjective. But, "She had a dark red apple," *"dark"* adds an idea to *red,* the adjective; or, in "It was a very good concert," should *"very"* be another part of speech because performing a slightly different office, a modifying word for an adjective instead of for a verb? Or in this very sentence, does the word "slightly" not perform a different office from the adverb modifying a verb? Students discover for themselves that the so-called possessive pronouns have double nature:—*their, his, our, its*—are part pronoun and part adjective. They cannot see that in "To be great is to be good," *"to"* is used like *"to"* in "He went to the concert." And I am not sure that I do, myself. You know in the method of the modern kindergarten, the teacher, to get the desired results from the children, often has to feign ignorance about many things. Grammar, to me, is giving the real thing,—the situation of genuine ignorance, which will arouse more life in a class, than all the definitely stated facts you can gather. And this fact that there are problems in grammar for teachers to solve is in part going to help bring back to life, poor dead grammar.

If I have made more of parts of speech than of any other phases of grammar, it is merely for the sake of illustration. I have happened to use in my classes, and work out more devices for this than for other parts of the subject. One should and can do the same with the sentence.

It remains for educators who have observed, or will observe carefully, the work in English in all grades of our schools to settle for us where to begin this study of grammar; how much, and what matters to fix at each step in the course. A school Principal who has been thinking about this matter expressed as his reason why students dislike grammar that they

begin the study of formal grammar too early in the grades. The place of formal grammar is before the high school, say many. Someone says, and with reason, that in the first year at least of the high school the pupil should be invited to enjoy his work in English. Thus, on leaving the Grammar School, the student should be thoroughly grounded in formal grammar.

And when the point at which to begin the study of grammar is settled I should like to see tried from that beginning what I call the inductive, or synthetic method of fixing the laws of language.

But, in whatever grade we teach this subject, let us see if we may not do for grammar what has been done for composition. Just as the latter may be made a well-liked and not an unpleasant kind of work, so, I think, may grammar become. If we find that we cannot live down the unpleasant flavor of the old name, let us change it in the curriculum, yet teach its essential subject matter with both a science and an art motive or view, if you will allow the expression. Whether, however, knowing the truth or the good in this realm will mean the practice, the doing of it, we cannot be sure. We may have best ground to hope for good, if we have found a method for fixing the knowledge which we want to become grammar-goodness in reality.

"READIN' AND WRITIN'."

OTTO C. MARCKWARDT, UNIVERSITY OF MICHIGAN.

In the general chorus of criticism which at the present time assails the English teacher it is well to ask, "Who of all these that criticize may claim a willing ear?" For the critics are many and varied indeed are the judgments. Here, the man of business demands the materially, the bread-and-butter useful in education; and there, with tongue more fervent, perhaps, than wise, the clergyman prays for the "sweetly moral." The doting mother pleads, "Make my child a loving and lovable child"; while the superintendent in his annual message says, "Make the boy a complete man,"—whatever that may maen. Here the professor of literature speaks: "Make him ready for culture; introduce him to the 'grand old masters,' to the 'bards sublime'"; while the member of the board of education—not to leave out Hamlet—growls: "Do what you can, do what you want to; but do it cheap." Strong and patient indeed must be the teacher who, confronted at every turn in the road with one or another of these demands, can press forward, sifting advice and honestly weighing argument; who can, despite these warring counsels, do her duty, keep her self-respect and her position. But difficult though it may be to determine to what extent each of these demands is just, certainly it is necessary to make the attempt.

Allow me to say in the beginning just a word or two concerning my claim on your attention. That as university instructor in rhetoric I meet in my work the high school student of at least average ability, cannot be denied. And likewise it cannot be denied that a close observation and frequent test of two hundred and fifty students fresh from the high school must have given me data for some very definite conclusions regarding high school English. I have examined them on the very points which—your high school catalog as witness—you have taught them. When to the above source of information, there is added the experience gained from four years of teaching of English in the high school, certainly it will not seem too presumptuous in me to point out at least one serious defect in our present average high school course. If I was in the kitchen when the cake was burned, and if I admit that I was implicated in the burning thereof, certainly I shall not be blamed if I say that the cake is burned; sooner or later the guest will find it out anyway.

I shall try, then, to give first very briefly an inventory of the stock-in-trade presented by a given body of students on the first day of their university course. Let me say here that I have inventoried not merely the material on the shelves within easy reach; I have searched the dusty top-shelf, the space beneath the counter and the garret and basement of the entire establishment. However, to anticipate a question which may be put, let me say at the outset that I speak from personal experience with my engineering students only; but that to fortify myself fully, I have collected such information as was necessary from eight of the other instructors of freshman rhetoric in the university and have found that on the following opinions we are all agreed. And furthermore, I have found that Professor Robert Herrick, of Chicago University, in a pamphlet published some three years ago gives expression to conclusions reached in his own work, very similar indeed, to those which I shall give presently.

About experiences common to the race in general the student certainly knows enough. He knows full well and can recite glibly indeed the multiplication-table of ordinary facts. Meet him socially, at the dance, on a country walk, at the boarding-house table, in the long line of ticket purchasers, discuss with him what constitute here at the university the question of the hour and you will find that his fund of knowledge and his ability to use it, is very normal indeed, and, I dare say, all that can be expected. You should see the complicated and withal light-running political machine which this young man can construct—and make run too—and politics is not a game for fools. You can find him working, and working intelligently in various fields of college activity. He knows people, this freshman does,—women and men, and sometimes he knows his instructors better than they know him.

So much for his ideas and general outlook on the ordinary affairs of life. Let us now consider his ability to express these ideas, to make clear what is this his student outlook. He talks fluently enough about common

things of life. As long as you conceal the fact that you are a teacher, you find him a talkative companion. His workaday speech clothes fit him snugly enough—a little too short in the legs and sleeves they may be, and perhaps a trifle too tight across the chest; but on the whole they do not much restrain his movements. It is only when he dons the more formal garments that he becomes awkward. It is only when he begins to write, that he begins to stutter. You should see the expression that steals over his face when he removes the cap from his fountain pen while rhetoric paper is being passed out to the class. If it be not positive disgust that is written there, it is surely nothing other than melancholy resignation. And you should read his compositions. About the very question which with his classmates he can discuss in an entertaining manner he can say very little on paper. The world of sights and sounds about him, which he can make interesting enough to his chums, becomes to him a cold and lifeless show. The whirlwind rush of the "Boston Special"—sixty miles an hour through the dark stillness—he will describe in a four sentence paragraph—"Honestly, I couldn't say more than that"—with barely a word suggestive of color and sound. He has lain alone on his back on the bank of a river under the starlit sky and sighed,—

"For old unhappy far-off things
And battles long ago;"

he has risked his neck for an interscholastic pennant and smiled through bitter tears of defeat; he has lied his way into scrapes and lied his way out of them; he has questioned the inexorable decrees of fate; but of all this nothing appears in his composition. These things so wonderfully vital to true culture, he keeps in reserve, a sinking fund of gold, and pays his English instructor off in worthless paper.

So much for the world about him; how is it with literature? Even the most modest teacher will have to admit that literature is being taught in the high school—the high school catalog says so, and the high school principal swears to it. From the standpoint of quantity an effort is made to read, as much as time allows, of the very best that has been written in England and America. From the standpoint of quality an effort is made to cultivate by reading and by study the student's appreciation of good literature. And to the credit of the high school teacher be it said,—both efforts are heroic and noble. But let us examine the result.

Take the freshman for a walk in literary fields out beyond the *Saturday Evening Post,* and what do you discover about him? He is nervous if not positively afraid. He goes forward with hesitating step, glancing about him for the shortest way back, much after the manner of a man who has just passed the sign,—"No Trespassing Allowed." The fact that this life of his with its room rent and board bills, its work and play, its failures and successes—the fact that this life is only the dream, the shadow, of which the other, the life to be found in the books, is the real, that I dare say has

never occurred to him either in thought or feeling—not in the very slightest degree. Now it may be that this is too much to expect. But surely it is not too much to expect that the characters in a printed book shall in some tangible or intangible way be taken into his life. Indeed they are not. They mean no more to him in that regard than does the twenty-third theorem in his geometry. Call line "ab," "cd" and he has lost it. Call the *Galley Slave* a railroad engineer, or an English instructor and the poem becomes a joke. Only in cases very rare indeed, does he see any connection between his own life, his friends and their doings, and the life and the doings and sayings of men and women in the books. I think I may say unqualifiedly that although he does remember something about his high school literature, he really does not understand it.

At this juncture I hear some one say: "Literature isn't to be understood anyway; it is to be felt and loved. In the high school we aim to make the student appreciate good literature." This is no time to wrangle about the meaning of terms, and so I shall take for granted that we all catch the general drift of the above assertion.

Let us take it to mean that the student's taste in matters of literature has been improved. Now, in view of the limited opportunity of the high school teacher to collect proof for it, this assertion rests altogether on faith; and it were foolhardy of me to attempt to disprove the above statement. Yet this much I shall say:—from my own experience in teaching in the high school, and from personal talks with high school teachers, and also from various letters received recently from teachers and principals, I have reached the conclusion that those who still maintain the position relative to the improvement of the student's taste, have for some reason or other failed to hear their ramparts fall about their ears. Let them talk a half hour—honestly—with the public librarian; let them read the reports from various colleges on freshman examinations. "Make the student appreciate good literature?" Vain delusion, ladies and gentlemen. "One of the tendencies has been to create a disgust for literature on the part of the secondary school teacher rather than a love for it," writes the principal of one of the best schools in the state. And my wn opinion is,—that you have taught him merely to doff his cap to the classics when he meets them in company with the teachers. The student has learned through bitter experience that politeness is the best policy.

I am afraid I shall be misunderstood if I leave this point without further explanation. Let me repeat a little of what I have said. Any personal faith that you may have to maintain your assertion that you have improved the student's taste for good literature is of course beyond the reach of argument. On that question I can waste no words. But this I do assert, and assert in full confidence that those who have studied this question under simlar conditions have come to the same conclusions: You have not through the study of so-called classic literature, in the slightest degree opened the student's eyes and ears to the wonders in the world of books; you have

not, to give you back your own words, taught him to appreciate and love the classics. You have not made him sing for Lycidas, except in sacrilegious joy that Lycidas is dead and earnest hope that he may so remain. From all the literary 'wealth of Ormus and of Ind' you have not brought into the student's life an idea to have and to hold and to love as his own eternally. He has read poetry and studied poetry; and he has read and studied books on poetry; but does he read it now? No, indeed!

But your failure is not what I mean to point out here. Your aim—high and blind—has called forth this criticism. "Our teacher told us," says one freshman, "to always ask the question: 'Is Ophelia drawn true to life?'" The boy was just fifteen when he was asked this 'stunner.' The question needs no comment. I wish to say, however, that to my way of thinking his teacher is on the right track but she is going the wrong way. Another freshman told me: "I don't remember anything about *Paradise Lost,* except that I got disgusted chasing up literary illusions." Who wouldn't? There is no need of multiplying examples. The current magazines, and recent books on this question are full of such naive statements.

Not satisfied with this oral testimony, let us see what the student can do when he has time; when he can reflect an hour or two and after that bring you his written testimony. If you have never quite understood what Wordsworth means by 'trailing clouds of glory' you can get the full meaning of the phrase from these essays. What healthy boy or girl has ever had an original thought about *Comus,* or about Macaulay's *Essay on Milton*? None, Brutus, None. And so he finds himself now in a hopeless quandary. The exact words of the critics he has forgotten. Since he has never clearly understood the meaning of their phrases, these mean no less to him now,—when he repeats them, omitting here and there the very words that could give them meaning.

And do you wonder at it? Literary criticism by so-called experts, except when at its very best, is about as fraught with meaning as are our ordinary greetings of the day. You cannot blame the boy therefore for 'trailing clouds of glory'; for losing himself in hopeless vagaries and remembered phrases which are no more a part of his real self, than is the halo in a mediaeval painting a part of the physical body of the poor saint over whose head it is hung.

In spite of what I have said, however, I must assert here that I cannot bring myself to the conclusion that literature cannot be taught. But I have reached this conclusion: literature is not being taught in the high school. It may be that sociologists will soon solve the problem for us; it may be that we shall learn from them that, owing to such and such tendencies in modern life, the need for the reading of good literature has disappeared in the younger students, as in the human body the need for the appendix has disappeared. But until such discovery is made, let us consider well the things we know and make the most of them.

The history of literature, as history, as a body of facts and names and

dates in certain chronological order—that I admit is being taught. And if you consider yourself still under the sway of that good old orthodox notion, which regards culture as a conventional accumulation of harmless facts, painfully acquired, no doubt the history phase of your literature teaching is important. No doubt in certain select circles the splendor of an evening gown pales into insignificance let once the lady who wears it be overheard saying in answer to a question from her rival: "Why, yes, I did know the name of the author of *Beowulf* as well as I know yours; but at this moment it has slipped my mind." And it is barely possible that the boy sometime after the framing of his high school diploma, may get into a 'social set' where opportunity may be given him to smile in conceited modesty while he says: "No, my dear; Pope was a gentleman who wrote the *Essay on Man,* and not a maker of touring-cars." Your culture study, you see, has become utilitarian and as such, in view of recent tendencies in education, it may have its place in the high school curriculum. But let there then be no deception about your purpose. Do not try to make yourself believe and do not try to make the girls and boys believe that in the study of the classics you are all scampering in joyful glee through grove and meadow after Pegasus, when in reality you are plodding through stony field and scraggly undergrowth after a poor stupid plow-horse.

I have pointed out already the student's inability to express himself, to tell what are his sense impressions and to draw from them any serious conclusions. I emphasized, as you may remember, that the difficulty lies not in the student's inability to use his senses for the gathering of material, but rather in his failure to make use of this material in any formal communication of his thoughts. Let us glance a moment at his paragraphs and sentences and words.

To me personally it is no great surprise to find how little the high school graduate knows about the paragraph. I have taught in the high school, and furthermore, I know something of the methods of high school catalog advertising, and, finally, I have a sense of humor. But my colleagues are for the most part serious men, and honest; and when they read in the high school catalog that the student is taught the principles of growth and structure of the paragraph, why, they believe that statement. Imagine their surprise, then, when they find that the student is almost wholly unable to appreciate that the order of the sentences is important in deciding the meaning and structure of the paragraph. Imagine their surprise when they find that the student when he has once written his paragraph for the first time, is almost wholly unable to apply any criticism whatever, to give any reason why sentence '2' should not be placed just before sentence '9' or why the first sentence should not be the last, or the last, first. As I have said: I am not surprised at this deficiency on the part of the student; I know something of the conditions in the high school. I know that in the time given to it there, a boy four years older in mental grasp could not learn what the high school teacher confidently believes she is giving her

pupils. Try as you will, ladies and gentlemen, teach, instruct, drill, and explain; you cannot make—at least, you have not made—the student appreciate that a paragraph is anything but an accidental collocation of sentences.

And what can I say of the sentence that will not seem a mere repetition of what I have said of the paragraph? I am reminded occasionally, while analyzing the student's sentences with him, of the goody-goody young lady in the fairy tale who dropped pearls from her mouth whenever she spoke. The student's phrases and clauses, subjects, predicates, and modifiers, come forth in the same manner as did that young lady's pearls, fortuitously, without even the slightest hint of sequence as to meaning and value. There seems to be on the part of the student very little conscious effort, and I dare say no ability, to make the form of the sentence play its part in bringing clearness and exactness out of the vagueness which generally results when the placement of phrases and clauses is left to chance. When the student has once found the merest shadow of the idea which he is seeking, immediately he writes it down, indistinct and vague, just as he first found it; revision, rearrangement of parts, are to him almost wholly unknown.

Perhaps you are hiding again behind the thin excuse that you have to some extent improved his taste in sentence structure. Perhaps you say, "Our students may not be able to tell a loose from a periodic sentence, but they have acquired a feeling for them and in writing can use them correctly." Though it were hard for me to contradict absolutely such an assertion, I may say, however, that it is the opinion of the instructors here, every one of them, that although you may have surreptitiously supplied the student with such a weapon, this nice discrimination in sentence form, he does not in actual conflict display any of that confidence which would be his were he conscious that he carried this weapon, but moves about in fear and trepidation, proud and boastful when he has won the way by a display of grammatical correctness.

I cannot leave this subject without saying something of the student's vocabulary. Except in rare cases this vocabulary consists of a few words—volunteers, mostly, overworked but untiring, gallant and brave, which like the little band of Leonidas of old, for a long time resist the invasion of new ideas. There is, for instance—to point out one classic example,—Colonel *Claim,* who does duty, and nobly does it, for Privates *Maintain, Assert, Think, Hold, Establish, Feel, Contend,* and the whole regiment of verbs of assertion. To this student an interurban car on a still night 'comes' around a curve; so does a shell 'come' through the air; so does a canoe 'come' through the water; so does a race-horse 'come' down the home stretch; so does a half-back 'come' down the field, and so does Christmas 'come.' And as far as I can find out, the final test of a word in description, that it shall bring to the reader the image which was in the mind of the writer, that test is a bit of erudition which strikes our high school graduate as finnicky at least, if not actually useless.

And if such cases, in which failure to present a vivid image to express

the desired idea seems almost the result of malice aforethought, if such cases are of frequent occurrence, how much more often will there be found in the freshmen essays examples of the loosest clause-connection and of the vaguest relationships. These matters are much more abstract and consequently much more difficult. A student, who only after a mental struggle can be made to understand that 'strolling' and 'walking' are not exactly synonymous, is not to be expected to be nice or even careful in choosing his conectives. No indeed. He uses the coupling pin nearest to hand. On a straight track without any grades 'and' will always do; for short distance work, 'then' proves useful; while to fasten the clauses together securely in order to avoid accident, 'so' is the most convenient and all-embracing and never-to-be-too-much used connective.

For fear of making my paper too long and tedious, I shall not take up the matters of grammar or spelling or punctuation. There is one point, however, which I should like to clear away before proceeding to the discussion of the literature read in the high school. Perhaps some of you are saying to yourselves, "Why, we tell our pupils these things; we tell them that great care must be exercised in the use of 'so' and 'then' as conjunctions; we tell them never to rest satisfied until they have found the word they need." No doubt you do. No doubt you tell them enough good things which if used to the utmost would make every one of your pupils a 'Father of his Country' or a surgeon in command of a fleet. No doubt you tell them. But remember, it is one thing to tell, and another to teach.

Such then is the miserable inventory of the stock-in-trade of the high school graduate. Let me take up next a review of the conditions under which this literary stock was acquired. You have seen the result, let me show you the cause. In the first place I must beg you to keep in mind that my information on this phase of the question is not a matter of guess-work. It is, alas, impossible because of lack of time, for me to give you an imposing array of names of the great and honorable, who at one time or another are supposed to have said so and so, or written this and that. And yet I feel that you ought to know at least something of the nature of my data. There is, then, first of all, my own experience in teaching in the high school and here at the University. There is furthermore such material as may be gained from serious discussion (not polite, remember, but serious) with high school teachers and university instructors. In addition to this, I have examined the outlines of the English courses in over twenty-five of the larger high schools in the state. Add to all of this, as seasoning, the fact that I have sat six consecutive times where you are sitting now and you must admit that if the dish be not palatable, the fault lies not with the ingredients.

To begin then. To an ordinary taxpayer it might be a matter of surprise to find how strangely deficient the high school student is in his English. But just a little reflection on the nature of the work done in these schools explains all. In these outlines of high school English which I have

examined there is to be found the same superficiality, the same lack of plan and purpose, the same formal, meaningless worship of names and things half understood—all of which faults are so glaringly evident in the university freshman's essays. No one could possibly imagine from these pretentious high school English courses that the pupils are innocent boys and girls. For you know you cannot make a woman out of Dolly by calling her 'Miss.' Whatever you may call them, they are all children. Let us not forget that.

Behold now, in his little recitation seat, Master John Henry Bright (age 16; grade 11-1); bespectacled, high-browed, inclined to baldness. Notice the sad look in his face as he utters in paternal despair, the words:

"How sharper than a serpent's tooth it is
To have a thankless child."

Or take this: Jennie Orstrom (age 15½; grade 10-2); afraid of the boys because they laugh at her flaxen hair and Swedish accent. Jennie declaims with prophetic insight, with more wisdom than her mother would give her credit for:

"Know then thyself, presume not God to scan;
The proper study of mankind is man."

Do you wonder, ladies and gentlemen, that these poor children consider their English as something outside of their real life? Do you wonder that they go straight from school to the public library to get a book which they can read for amusement? To me this whole course of high school literature seems, even in the light of kindliest criticisms, as none other than a tightly fitting garment, in which one feels compressed through the whole evening and which one hastily removes upon arriving home, exclaiming with a long sigh of relief: "Thank goodness, it's off!"

Even at the risk of wearying you with things which you already know, I cannot refrain here from giving if only briefly the conclusions I have reached from examining the various high school English outlines. The present system of teaching literature may be divided into,—(1) the plan of taking up the classics without any apparent order, and (2) the plan of correlation; which plan, because of an unfortunate arrangement of the high school history courses, not seldom takes on the aspects of the so-called 'culture epoch' (evolutionary theory): that every child epitomizes in his development the experiences of the race in its progress from barbarism to civilization.

I cannot attempt here any exhaustive criticisms of these plans. I may safely say, however, that a fortuitous sequence in the study of the classics manifests but little consideration for the development of the child mind. A comparison of twenty-five outlines shows with the exception of one classic, absolutely no uniform plan of procedure from the less to the more difficult. This exception is Burke's *Speech of Conciliation,* which—so tough

that it will not yield—in every case has been put after the second high school year. But for this single exception one might almost conclude after a very careful examination of the order in which the respective classics are taken up, that each school had adopted the order in which they were shaken by 'Fate and the Sisters Three' out of the public school hat. The *Idylls of the King* range all the way from the first to the fourth year inclusive. The *Last of the Mohicans* may come from under cover at any time. *Snowbound,* too, may happen along at any time, winter or summer. You may find the *Princess* in the eighth grade or in the twelfth. The *House of Seven Gables* may find scampering through it boisterous freshmen or grave seniors. *Coriolanus,* I myself, slightly under the influence of correlation, have taught in the first year. And *Hamlet*—oh the shame of it!—has been taken up as introductory to the high school course. The conclusion to which such comparison points is that the classics are so much literary food to be swallowed without any regard whatever to the digestive ability of the swallower.

The criticism to be made on the first part of plan (2), that is, the correlation plan, is that it has a tendency to burden an appeal to the emotions with intellectual matter (nearly always very unimportant), and thus to make the appeal much more indirect and consequently much more difficult and at times even quite impossible. It almost inevitably tends to make the *Odyssey* a text-book on Greek 'Kulturgeschichte' and geography, of which two subjects the former is too difficult and the latter quite useless. To state this in other words for the sake of clearness, this plan tends to join the new emotional experience to an intellectual experience also very new—a cold fact memorized for the history class—instead of weaving it into an emotional experience acquired by the pupil in his own immediate environment. Literature, the art, becomes history, the science.

A second criticism to be made on this plan is that when the study of literature is made to run parallel to the study of history, the cloth is cut to satisfy the demands of an external chronological arrangement of questionable usefulness, rather than those of an inner mental need of the pupil. One may just as easily cut a glove from the pattern of the shoe, and expect the finished article to fit the hand.

The socalled culture epoch (evolutionary) plan of studying literature in the high school very easily lays itself open to criticism. Its champions do not place much emphasis on the fact that every child epitomizes in his development the experiences of the race in its progress from barbarism to civilization. To put emphasis there were laughable. The age of the fairy tale, of the myth, and of the epic has passed out of the boy's consciousness when he enters the high school at fourteen. He is decidedly modern. To expect him to run his development from freshman to senior parallel to the development of the race is as unscientific as it is simple.

It is maintained, however, by the champions of this theory that it combines the advantages of correlation with history and those arising from

any chance similarity—exact or approximate—existing between the development of the individual and that of the race. It does not definitely say,—from the Greek, through the Roman, through the mediaeval to the modern. It insists only on a beginning and an end: from the simple primitive to the complex modern. To fill in the intervening dark ages it relies entirely on chance and the college entrance requirements.

Such then is the clinical record of the case. The conclusions to be drawn from it I have already suggested. First of all: a closer personal acquaintance with the pupil and his needs; and second, a better understanding of the purpose of education and also of the means by which this purpose is to be effected.

Of the first of these conclusions I can for lack of time, say but little, and that in the form of a generalization. Under our wholesale system of instruction it behooves us all never to lose sight of the fact that education is for the pupil and not the pupil for education. And let us never forget that this boy or this girl comes to us with a bundle of tastes and interests stamped and labelled long before the first school-bell in the state sent forth its dolorous clang. They come from homes some of them—and among these the worthiest—into which (shall I say—thank heaven?) the influence of culture and college entrance requirements has penetrated no more than it did into the home of Burns's simple cotters. And so when Johnnie on the back seat fails to be inspired by Milton's sublime epic on Christianity, or by Spenser's *Faerie Queene,* lay not the blame on Johnnie. You may as well blame Milton. The boy is not stupid, nor is he lazy. Take him in his own particular field, which, it is true, is often hard to find, and he will show no mean ability to observe and to draw conclusions; and he will give prof of no mean ability for work. This same boy, slow-witted and dull-eyed in the class-room, will show on his native heath an eye for color and size and movement, a ready ear for sounds, and in general a quickening of the mental powers which might well make him the object of envy of some of his teachers.

Then too, not infrequently this boy reads extensively. His favorite literature I shall not attempt to discuss: the point is that certain kinds of literature the boy reads of his own free will. But, of course, if you pluck him by the ears out of these his natural surroundings and drag him into the presence of Milton and Wordsworth and Pope and Spenser and Burke and all that vast unnumbered legion of the dead,—no wonder he is speechless. And no wonder he resents it when you scold him, and ever after hates the classics. He is not getting a 'square deal.' You measure him with the same heartlessly arbitrary (and I may add dishonest) yardstick which you use to measure mature men and women of higher education and wider experience, and no wonder he seems small, and deformed.

Nor does the girl fare much better. She is of course somewhat more mature than the boy of her age, somewhat more open to suggestion and somewhat more nimble in responding to an appeal to her emotion. But

even with these advantages she finds herself in a sorry plight. Her real life as a girl, her most heartfelt wishes, her longings, her fondest plans for the future, seem to her certainly remote from anything the classics have to offer. And so when she fails to put feeling into Hamlet's soliloquy, or giggles while you read the sleep walking scene in *Macbeth,* rest assured the fault lies not with her.

If I were the physician called into this at present somewhat hopeless case, I should recommend,—not merely a change of diet, but a change along lines already indicated, of the whole course of treatment. It is time we came to our senses concerning the purpose of the teaching of literature and composition. If we regard as the end-all an impersonally conducted tour through the classics, which shall leave in the mind a garret full of useless information, our present system of teaching is highly adequate. Again, if in his compositions about books we desire the student to echo with a subtle mixture of conceit and contempt, the half-remembered, jumbled phrases of critics; if in his compositions about himself, his friends, and the world about him, we want him to be vague and incoherent, often ungrammatical and generally unrhetorical, why, then again, our system of instruction is highly adequate.

Now, I take it we are all agreed that literature is an interpretation of life; and that it aims at a widening of the student's outlook on the world about him. From that standpoint, then, I maintain that the literature for he student of fifteen must interpret the life of fifteen. If ever the pupil is to be made to appreciate and love literature, it must be accomplished through his own individual experiences and not through any stray facts dragged in from the history lesson. To expect the high school freshman to read with interest and with profit the product of mature minds, intended, first, last and always, for mature and serious men and women, is not much less absurd than it is to expect the general public to find food for thought in a doctor's thesis on the Greek accusative. Ask the professor at the university what he can teach his students other than the cold history of literature, and his answer—if he be honest and if he know his students—will make you feel ashamed of yourself for thinking that you are teaching the blessed heart and soul of things, when you are merely imparting bloodless information.

The teacher of literature might with great profit ask himself,—"To how much of the literature which I am now teaching as indispensable to a cultured mind, and potent in moulding character, to how much of this did I feel myself drawn as naturally at the age of twenty-three or twenty-four, as I expect my pupils to be drawn to it at the age of sixteen?" And further he might with great profit ask himself: what foreign scenery, what knowledge of history, what lessons in science and in art, what bitter experiences in life, what friendships and what enmities and last of all what sheer exasperations to find for his own composition the happy phrase—what wealth of cortical activities, in short, was necessary before he could say in

all sincerity:—"This, my children is really beautiful; for tomorrow, write an essay on it."

"But if not these classics, what then shall we read?" is the question which by this time has occurred to some of you. This question implies two very absurd conclusions: first that I have knocked out of our high schools all English and American literature; and secondly, that some certain man, or group of men from their secluded study, can choose for you and for your pupils, nay, for all the teachers in the land, and all the pupils, what shall be read and what shall be discarded.

The first of these conclusions I can discuss but briefly. I am not making war upon the classics. That band of gray-beard patriarchs may rest in peace. My position is with the high school student on the defense. I maintain only that in making out a course in English we must consider first of all the needs of the pupil. I maintain that in the high school course, as indeed in any course in English only that book is worthy of consideration, which in virtue of a strong appeal, emotional or intellectual, interprets for the boy his own environment, and thus by stimulating thought and observation thrusts upon him an everwidening outlook on life. Now is this to be trumpeted forth as a far-flung challenge merely to a certain few of the feebler veterans of the classic army. Forget the personal grudge that you may have; examine them all with due care; try this test on Burke's *Conciliation Speech;* on Chaucer's *Canterbury Tales;* on Macaulay's *Essay on Milton;* try it on *Lycidas,* on *Comus,* and on the *Faerie Queene.* Try it on them all, and admit them only because they can pass the test, and not because, forsooth, they are so very ancient, or because they come recommended by a college professor whom you think scarcely able to prescribe your own reading.

This brings me to the second conclusion implied in your question: that some certain group of men shall choose your books for high school teaching. From the point of view which I have taken in this paper such a demand betrays—whatever you may call it—a shifting of responsibility—shameful in intent and most injurious in effect.

I have pointed out in great detail the effect of this prescribed literature on the pupil. Of its effect on you I can speak but generally; for these things none may name except with bated breath. They are the skeletons at the feast which cast a gloom over all the company. Who is there, let me ask, among you, whom the hollow ring of his voice has not alarmed when praising to his class the literature which he himself regards with deep suspicion? What teacher has not seen in the pupil's honest eyes the most stinging rebuke for feigned enthusiasm? What teacher has not turned from the tragedy of ninth grade book reviews in keen despair of making 'infant critics'? Surely, the paltry thing you buy, is never worth the cost.

Need I say more? Need I remind you that English is a personal subject, not an intellectual tread mill like physics or like mathematics? Need I repeat that its material must be taken from and brought into the

pupil's individual experience? Is it not clear to you that just because he is prescribing for a general abstract pupil, our professor recommends such literary algebra as Burke's *Conciliation Speech?* For Jacob Van Oeveran he would never prescribe it—not if he knew Jacob. Be content then, to let him prescribe what a certain small proportion of the high school graduates must know for college entrance. But do not let him rob you of your greatest opportunity to use your own intelligence. And further, do not let him force upon your pupils one and all, as chiefest literary pabulum these heavy classics.

So much for the literature. Let me offer in conclusion just a few suggestions for the compositions. On this part of the English work my remarks must be very general. For I do believe that a goodly share of our perplexity has resulted from the fact that we have taken as a panacea for our ailments certain too easily teachable text-books. Here again, as in the case of the prescribed literature, it must be evident that, judged by the conditions under which such a book is written it can mean no more than a general plan of campaign, with illustrations and instructions as to the most effective use of these implements of war. But the planning of the various skirmishings, the flank movements, the various methods of attack —all this must be decided upon by each indidual teacher for each individual occasion.

Stating it generally, then, I take it that the end of composition, as indeed the end of all education, is the development of an effective personality. And further, I take it, that the only conditions under which such development is possible, are,—first, a strong personal reaction upon environment; and, secondly, effective expression. But what can I say in explanation of this statement of the aim of composition that will not seem to you a series of do's and don'ts? The phrase "a strong personal reaction upon environment" at once suggests the nature of subjects for composition. No one can write effectively on a subject to which he is indifferent. The world without must smite the sense within. A subjective description of the soft clouds in a summer sky is sure to be as evanescent as those clouds, and for the boy wiggling about on the bleachers at a baseball game, quite as useless. A three hundred word essay on the life of Edmund Spencer offers the student but little practice in composition, because the material and expression are as rigidly prescribed, as are the form and content of a city directory. Nor is a discussion of the rhetorical principles employed in *Paradise Lost* likely to develop in a boy's character any but a very undesirable trait. And as to literary criticism in general, I may add that one good way to get a pupil to dislike a poem is to ask him to tell exactly why he likes it. On the whole, then, his composition must be based on things and events to which he is intimately related as a boy.

In the matter of effective expression let me suggest one thing which I believe is too often overlooked: the need for constant and intelligent practice. No one ever learned to describe by memorizing the principles of

description. Constant practice in writing and repeated study of models are necessary. And such practice must be intelligent. The exercise in composition must not become a guessing contest. Paragraph development, except the very, very simplest, must always prove for second and third year students a hopeless task, responsible very often for a most injurious result. The most effective theme for teacher and for pupil is one in which the subject matter suggests the manner of expression, no less surely than to the street urchin the pastry in the baker's window brings on desire. And in like manner, the most effective course in composition is one which thrusts upon the student a rich environment, and thus by stimulating thought and observation leads to an effective interpretation of the world about him.

And thus I leave the problem with you. It is yours to solve, not mine. To me the solution lies in this direction: our high school literature must be made to meet more adequately the demands of the pupil—girl and boy. Let that be the ultimate test. And composition, instead of slinking about the English house must be made to take her place at the head of the table along with literature. And better yet, to banish all formality—suggesting shallowness in thought,—to banish all superficial polish—suggesting wordiness and rhetorical decorations,—to establish between these two sisters a spirit, friendly and helpful, let us call them just,—"Readin' and Writin'."

BIOLOGICAL CONFERENCE AND SCIENCE TEACHING.

"The Just Claims of Biology in the Curriculum of Secondary Schools," Professor Otis W. Caldwell, University of Chicago. "Shall the Study of Botany and Zoölogy in Secondary Schools take the form of Natural History, or of the Study of Types?" Papers under this title by Professor Nathan A. Harvey, State Normal College, and Mr. W. P. Holt, Central High School, Toledo, Ohio, are printed in full in the Report of the Michigan Academy of Science. Discussions of these papers follow: Miss Grace Ellis, Grand Rapids; Professor H. M. McCurdy, Alma College; Professor Wm. E. Praeger, Kalamazoo College.

JUST CLAIM OF BIOLOGY IN SECONDARY EDUCATION.

PROFESSOR OTIS W. CALDWELL, UNIVERSITY OF CHICAGO.

In assigning this topic, your committee may have had either of the following things in mind. Perhaps the constant clamor of biologists and non-biologists relative to what botany, zoölogy, or biology, should accomlish in the high schools, the constant clamor for the teaching of morphology, physiology, ecology, taxonomy, natural history, general biology, economic biology, industrial and agricultural biology may have led your committee to say, "Well, what's the use anyway?" Do biological subjects justify their present position in secondary schools? Should more or less time be given to them? Do we need constantly to rethink and restate these claims in order to assure ourselves that these subjects have had their full opportunity for efficiency in education?

In order to come to an equitable statement of this question, we must consider it under three aspects.

First. What is Secondary Education for?

Second. What is the particular function of science in secondary education?

Third. What in this Secondary Education is the particular function of biological science, and what should be the organization of biological subjects in the course?

I. The Function of Secondary Education.

Early in the last century there existed in the Eastern United States a number of private academies and tutoring establishments which doubtless were the forerunners of free high schools, at least, served as the stimulus for the organization of these schools. These existed solely as means of preparing young men to enter college. Their subjects were usually taught by ministers, and whether always openly recognized or not, a very potent purpose had to do with preparing young men to pursue theological studies. It should be said that at a very early date the purpose of these schools became more broad until they recognized their function as being to prepare boys for general college courses. Several things show however that this purpose was not *unnecessarily* broad, since each of these schools existed to prepare boys for meeting the entrance requirements for some particular college. We still have many such fitting schools with such specific preparatory functions and many of them bear the names of the colleges to which they expect to send their students. Almost all colleges in this early day were compelled to maintain preparatory departments to fit students to carry college courses. The separate fitting school was sometimes directly stimulated and fostered by the college itself. Just as in the regular college preparatory schools attention was entirely or almost entirely confined to teaching those things required by the college for entrance, in these fitting schools attention was focused in similar directions.

Just so soon, however, as conditions of living and general ideals improved in the country, so that a total school period longer than that offered in the elementary schools began to seem desirable and possible to a considerable number of parents, the public high school came into existence. It came into existence for two purposes, (1) As a means for extending more widely the preparation for college toward which fitting schools and private academies had been working, and (2) to give a better general education than was afforded in elementary schools without any reference to college. Probably the first regularly organized high school was that organized in Boston in 1821. One at Portland, Me., was organized in the same year. The total number of free public high schools established in the twenty years between 1821 and 1840, in cities of 25,000 inhabitants and over, was seven.*

The course of study in these schools was absolutely dominated by college entrance requirements. In this connection the statement made in 1903 by Supt. Seaver of Boston relative to the Boston Latin School is interesting.† He says: "As in the beginning, so ever since down to the present time, this school has aimed to give the boys of Boston who wished to take it, the best possible preparation for the University. Of course the

* (See Dexter—History of Education in U. S. p. 171.)
† (See Seaver—Report of High Schools of Boston, 1903.)

'University of Cambridge' was the only one thought of in the earlier years; but as other universities have arisen this school has opened the way to them all."

But in the earlier part of the second half of the last century two far-reaching questions arose. One was, should the colleges require a strictly classical course for entrance therein, and should the high school exist primarily to prepare young people for college. In response to arguments upon these questions numerous changes came into the high school curriculum. In some schools the entire course was changed while in most of them special courses, as the English Course, the Scientific Course, and the Latin Course, were organized. The Boston English high school in at least one year prior to 1860 showed a remarkable attempt to meet the popular demand by announcing the following subjects in its curriculum: arithmetic, algebra, geometry, geography, general history, history of the United States, reading, grammar, declamation, rhetoric, composition, bookkeeping, natural philosophy, moral philosophy, evidences of Christianity, navigation, surveying, mensuration, astronomical calculations, Constitution of the United States, drawing, logic, and French, all offered within the limits of a three years' course. This course speaks of recognition on the part of its framers of a need of making high school education worth more in practical living than had previously been true, but it also speaks of a great failure to see what was really involved in making high school education of most worth from the point of view of the needs of practical life. It speaks of an old and still living belief on the part of a good many people to the effect that a less thorough education is requisite for those who do not go to college than for those who do go. We believe, furthermore, that that education that is best for those who do not go to college is that which is best for all, therefore best for college entrance requirement. We believe that if the old purely classical education needed to be so largely supplemented by introduction of science, English, history of our own country, applied sciences, etc., in order to fit people to go directly into "practical life," very much more should these things be introduced for those who do not go directly into "practical life," in order that they, in their college courses, may maintain a proper perspective relative to the stage of civilization in which they live. We need this to help maintain a proper balance in social sanity for those who by virtue of their future college work are in danger of losing that contact with practical living, which being lost, exposes them to the often well-based accusation that college graduates are less efficient members of society than their superior advantages justify us in expecting them to be. We need to plead for a general high school education quite as much for those who are to go to college as for those who are not to go. The colleges are recognizing this truer function of the high school, and at present some of them, and at an early date all of them will accept for entrance, the graduates of all good four-year high schools almost regardless of what

the four-year course is. The high schools are recognized as existing to give that general education which is best for the majority of its students. The college is glad to help in finding what that "best" is, *but for the good of the pupils of the high school,* holding subconsciously meanwhile, the knowledge that what is best for the young people will prove best for the college. It is not desirable that all or nearly all high school graduates should go to college, and we are beginning to adjust ourselves to this discovery. But it is best that the high school should present those subjects that, while giving best educative values, give fullest preparation for intelligent and sympathetic participation in the stage of civilization in which we find ourselves.

II. Function of Science in Education.

We need do little more in this connection than to cite the potent arguments so often produced upon this subject, and until recently quite generally accepted, but now opened for reinvestigation by psychologists who claim that mental training in one kind of work has no direct influence in any other kind of work.

The rigorous and highly valuable mental discipline of classical studies has a full equal in several kinds of science study. Classical studies still have a superior merit in their effect because of the much longer period during which pupils are exposed to them—an advantage never yet fully realized by teachers of science in general. This is not an argument against science however. If a photographic plate is exposed an insufficient length of time, shall the light be accused of inefficiency because an incomplete picture is secured? But this light is so tremendously active that with brief exposures results are secured which were utterly impossible by means of a more sombre light.

The problem attitude of mind, which most of us agree is that from which the best educational results come in any subject, is peculiarly omnipresent in science, if the teacher and the text-book and older type recitation method will stand aside sufficiently and serve as guide posts accurately enough to direct the student to the real materials that face him. The great function of science in education is to inculcate its method of attack, to teach students to approach phenomena with the questions, "What is it?" "What is it doing?" "How does it do it?" and, "What are its relations to other phenomena?" To teach to withhold judgment until there is basis for a judgment; to reduce the quantity of human conversation and improve the quality; to teach that he is a cultivated man who can in the midst of the turmoil of emotionally conflicting ideas withhold conclusions until the intellectual atmosphere is clarified so that real data may be considered. The value of this problem attitude of the mind is so generally recognized that one of the best recommendations that can be given a teacher of classical or modern languages, or history is to say that in his teaching he uses the scientific method. Indeed some teachers in fields other than science claim

that the scientific method is quite as easily asquired in their subjects as in science itself.

As a matter of practical value the scientific method is of great importance. The difference between its value and that of a given sum of practical knowledge is like the difference in value between one isolated result already in hand, and the means of accomplishing an infinite number of results, each as valuable as the one. It is like the difference of possession of one coin and the possession of a manufacturing plant by means of which a very large number of coins may be earned. It is the difference between having a solution of a problem in life handed to me already finished in the form of expert advice, and having conferred upon me the ability to solve thousands of problems for myself. A working knowledge of cause and effect gives a most saving influence. If an abiding faith that causes must bring effects, that we cannot sidestep results if we have set causes working except by interjecting more potent causes, be fully realized, it will save us many intellectual, ethical, and financial pitfalls.

All education consists in seeing likenesses and differences and in properly relating them. Science is preëminently a subject for use in discipline in seeing and relating likenesses and differences, therefore for reaching the fundamentals of all education.

But science has other functions in education than its primary one of inculcating its method. The human race lived in relation to natural phenomena long before it had a spoken language, or any kind of organized history. Indeed no small part of history is the record of man's relation to his natural environment. Out of this nature environment of man the various sciences are organized. Not new, are they, in the history of the real education of men, though new in records of school curricula, but older than all other subjects, when thought of from the point of view of what men had to learn in order that they might continue to live. It is true that this old body of knowledge was not science from a modern point of view, but it contained the materials out of which modern sciences have been differentiated.

Science deals with a body of knowledge some of which is essential to any well-rounded education. Her applications meet us a thousand times a day in our clothing, our food, in the care of our homes and our health, in our books, pictures, and music, in our transportation and communications on the earth, in the air, and under the sea; in our making habitable the uninhabited places of the earth, and in some way with nearly all that has to do with the making of an efficient cultured man. Social, industrial, and intellectual life are so largely, and intimately associated with science knowledge, that omitting the larger value of the scientific method of thought, just to be decently intelligent as to the thought and activity of our day science education should be had by all.

III. The Particular Function of Biological Science.

Under I, I have tried to show that secondary schools exist for the purpose of giving the best general education to the largest number of high school students, such education being as broad as is consistent with proper mental development. Under II, I called attention to the fact that the primary value of science in education is found in its method, but that its body of knowledge is of such importance as to be requisite to any well rounded general education. What then is the particular function of biological science in secondary education?

1. Universal Interest in Living Things.

The universal interest in things that live gives biological subjects an initial interest not always enjoyed to so great an extent by the physical sciences. Furthermore, pre-secondary school days usually have brought to boys and girls more extended observations upon plants and animals than they have upon physical phenomena. In beginning the science work of secondary schools, therefore, advantage should be taken of this strong initial interest. It must be borne in mind that the pupils are rarely, if ever, cognizant of the fact that they are acquiring the scientific method of thought—they are trying to find out about things, and in so doing may develop a good thought process. Therefore to get and maintain a proper interest in finding out about things, care must be taken to begin and continue with things in which there is some significance or in which such may readily be developed. In other words biological subjects offer materials for presenting real, significant, life problems with which work may be done. Without this significance in the beginning of science work, genuine interest in solving problems is hard to secure. I do not wish to be understood as saying that physical sciences cannot be used in a similar way. They can be, and are, but biological subjects, because of the life element and more extended previous concrete experiences, often give a more logical beginning for science work.

2. Biological Subjects and Domestic and Industrial Life.

A second special function which biology serves in education, relates to the fact that plants and animals enter so largely into the life of the home and into the industries. A good course in botany will give a broader notion of the fundamental industry of agriculture in almost all its phases, as, "plants and the soil," "plants and water," "plant diseases," "the storage of food," "plant breeding," "grafting," etc. A good course in zoölogy will do the same kind of thing for the animals of the farm, and together they will lay the proper foundation for a knowledge of human foods and human physiology and hygiene. A course in botany should make more significant the facts relative to the world's timber supply and its uses and distribution.

Such courses will also lay proper foundations for intelligent reading and understanding of the rapidly increasing general literature which is based upon biological knowledge.

Furthermore, in this connection it is quite in point to refer to the recently begun but already large movement toward establishing such high schools as agricultural high schools, commercial high schools—industrial high schools of many sorts—to meet the persistent cry for an education which shall be more practical than the superlatively classical education of the older schools. Since the older school taught little that related directly to practical life—though indirectly it did a very great deal for practical life—a clamor for a distinctly practical secondary school education has become so loud and potent as to endanger the very cause which industrial education enthusiasts are advocating. Most of us are agreed that our secondary school education must have more practical bearing; must have to do with materials that have an appreciable industrial, social, intellectual, or otherwise enjoyable singificance. But we are extremely anxious to have it understood that by this significance we mean very much more than relation to a vocation, a trade, or an art. The establishment by public taxation of separate public trade and industrial schools as coördinate in rank with our present secondary schools will be a long step toward making caste schools for artisans. It will deprive boys and girls of the general cultural perspective which comes from being educated with their fellows who are not to work in the same vocation with themselves, and will further deprive them of the fundamental education upon which industrial training should be built. We need in our secondary schools, some courses which constantly suggest industrial opportunities—possibly some which look directly toward special training—but courses which will lay the foundation for work along these lines, and because of their being general but suggesting special lines for future special vocational training will enable the worker in one activity to appreciate in a measure the needs, trials and opportunities of the workers in other capacities. Courses in botany and zoölogy, properly taught, are peculiarly fitted to educate and at the same time to suggest practical significance and vocational opportunities. Teachers of these subjects sometimes seem to have felt that they belittle their subjects if they use biological knowledge or materials that have practical value. They would prefer to study germination by use of the cocoanut, Ricinus or Lupinus, than by use of acorns, beech-nuts, corn and beans, though the latter are better from almost every point of view; and there are zoölogy teachers in secondary schools who expend not a little of their meagre expense fund for animals from deep waters when the school environment is overflowing with material of equal zoölogical value and of immensely greater practical significance. Botany and zoölogy as sciences are stronger, not weaker, because their illustrative materials have practical value. Will not a lumberman whether city salesman or woodsman be a more helpful,

happier, probably more successful lumberman, if he knows the botanical nature of wood fibre, annual growth of wood and bark; and will that man not be a more potent farmer or commission man who knows zoölogically the morphology, physiology, and life habits of his animals? The trouble is that too many teachers of botany and zoölogy have had the subjects in colleges and universities in such ways as to cause them to develop complete immunity to infection with the real spirit of their subjects as applicable in secondary schools. The college course is not applicable in secondary schools. "But," said one teacher, "I studied Nereis in college, I must have Nereis and not earthworms for my high school students," and Nereis it is. And the fascinating earthworm, its home, its habits, its offspring, its relation to soil fertility are lost in order to study a type of worm anatomy less appropriate for the teacher's purely anatomical purpose even, than is the one living at hand. The old story of the surgeon who could not amputate a patient's right arm because he was a specialist in amputation of the left arm may be untrue but is too good an illustration to pass unmentioned.

3. Fundamental Manifestations and Laws of Life.

In a paragraph above, the general life interest of practically all students was suggested. But interest in life and knowledge of the fundamental laws of life are quite different things. Problems of life in a constantly changing environment, sometimes favorable, sometimes unfavorable, problems of conflict and compromise with enemies, with friends who desire the same food, with exigencies of the physical environment, and the adjustments in structures and habits enforced thereby, give a new vision of all life; intimate knowledge, nutrition and the food problem of plants and animals from simplest to most complex, broadens our conceptions of the meaning of things physical and biological; and the mystery of reproduction can be adequately presented only when approached from a biological point of view.

4. Necessity of Course in Botany and One in Zoölogy.

Can the purposes above mentioned for teaching biology in secondary schools be met by a course in biology as well or better than in separate courses in botany and zoölogy? In quite recent times a somewhat vigorous attempt began which looks toward a return to a course in biology to supplant the fairly generally separated courses. At the meeting of the Central Association of Science and Mathematics Teachers in St. Louis in December last, a very strong and ardent plea was made for the course in biology, it being claimed that the course should come in the fourth year of the high school, and preceded by physics, chemistry, and physiography in which physiography course, plants and animals shall have received natural history treatment. Before Section L of the American Association for the Advancement of Science was presented an equally ardent plea for the course in biology, it being argued that the course should come in the first

year of the high school and should be treated entirely from the natural history point of view. The lists of topics offered in the two courses just mentioned were quite similar, but evidently there is considerable difference in purpose and ways of securing results. It is further important to note in this connection that of the 19 members of the committee on the definition of the unit in botany for the North Central Association of Colleges and Secondary Schools, but one reports as favoring the course in biology in secondary schools and he says "this is a feeling on my part and not a conviction backed by any specific reasons I could state in satisfactory form."

It seems to me that there are some very important reasons as to why botany and zoölogy should be maintained as separate subjects. It is true that the two subjects are closely akin and have very much in common. But the claims of the biology course are of two classes, (1) There are those who advocate the use of very elementary topics in the field of living things—that is the point of view of the natural history of the grades, and (2) those who advocate the study of general biological processes which can be illustrated and studied only by means of a good general knowledge of physical processes and of plant and animal structures. The first point of view belongs in the elementary school and will be there if our long-time dreams, as yet unrealized, of a sane and worth-while natural history should ever come true. The second is the kind of course most of us could take with fullest profit only after we have had two or three good courses in each of the subjects in question. We do not try to study the theory of numbers before we have addition, and multiplication. We have learned that it is wise in the study of foreign languages to study the language a good while before we take up the philosophy of language. We do not attempt to study the generalizations of history before we have in hand a considerable body of data regarding history. Furthermore, in treating living things as sciences we cannot develop in the best way the proper attitude of mind toward problems unless the problem and the illustrative material be sufficiently alike to give continuity and conclusiveness within a narrow range of variation. These are not really so possible by use of biology as by use of botany or zoölogy. If we should visit generally the courses in botany and zoölogy now being taught in many schools, we should see at a glance that courses are already suffering tremendously for lack of definite aim, and continuous underlying purpose which organizes materials in such a way as to develop the scientific method or a justifiable knowledge of these materials in relation to one another. A course in biology would expose us to the danger of still greater indefiniteness in purpose and consequent incoherence of results secured.

5. *Time Given to Subjects.*

Each subject should have a full year's work, but in the present state of the curriculum such cannot be advised for general use unless many changes are made in requirements and electives. If four years are re-

quired for proper education in Latin, in English, in history, in mathematics, surely science men are modest in asking for four years made up of all sciences. This is especially striking when we consider the unsurpassed educative values that are possible, the accompanying benefits in knowledge of things that make up so much of the life of our day, the increase in enjoyment through contact with different aspects of nature, the benefit in increased efficiency. E. Ray Lancaster in a most stimulating book entitled "The Kingdom of Man" says that science has opened a new kingdom in education and practical life, but that we are too modest to possess it.

Neither botany nor zoölogy has anything to fear from being left as entirely elective unless, as too often happens, other requirements are so large that although these subjects are left as electives, the student's time is filled by other requirements. I do not consider that such an arrangement makes botany and zoölogy electives. Such is like the magnanimous father who promised as a holiday to his hard working boy the first day which had twenty-five hours in it, the promise having the double guarantee to the father that all experience was with him, and that it couldn't really be demonstrated that the day had 25 hours until it had passed.

If but one year is given for both, should it be given to a half-year of each or a full year of one? If the latter, which one? A half year to each is to my mind greatly superior to a year of so-called general biology, in fact most courses claiming to be general biology are really courses made up of botany and zoölogy one following the other in text-book presentation. Such is not general biology. While it seems from many points of view better that a full year of each subject should be given, I doubt if such can soon be brought into anything like all the schools. If a full year of but one is taught, it should be the one the teacher can teach best.

6. Where in the Course Should Botany and Zoölogy be given?

If the needs of the subject are considered, the later in the course, the better, but no science is better than these in laying early the foundations in proper habits of problem solving, in stimulation of interest in science in general, and in giving purpose to the work done, in pushing out the boundaries of the thought horizon. The secondary schools exist for the boys and girls not for subjects nor for future work in colleges. Therefore subjects should be placed wherever in the course they may benefit the students most. The thing that botany and zoölogy can do for boys and girls should be done as early in the high school course as possible in order that the influence may help throughout the pursuance of other studies.

DISCUSSIONS.

Abstract of Discussion on "Shall the Study of Botany and Zoölogy in the Secondary Schools take the form of the Study of Types or the Form of Natural History?"

PROFESSOR H. M. MAC CURDY, ALMA.

The best teachers succeed in spite of the restrictions imposed by conventional methods. Unfortunately many are kept from achieving their true share of success by stress of work and by the power of examples previously set for them in their preparation.

Rarely are the opportunity, patience, knowledge and skill all at the command of the teacher to work out methods directly adapted to the needs and demands of the students in botany and zoölogy in secondary schools. In by far the majority of schools the methods—or lack of method—used is the product of a series of omissions of some parts and modifications of others of the methods used in the classes in which the teacher was a student. This means the attempt to transfer the materials and methods of higher institutions into secondary schools. Methods like plants may or may not be transplanted successfully from their original habitat. It depends upon the character of the two habitats and the powers of acclimatization. The original habitat of the type method of study was in the college and university, and its chief aims are to teach the inter-relations of the various groups of plants and animals comparatively and its natural effect is to emphasize the evolution of the higher from the lower.

In the outset the question may reasonably be asked, are the aims of the courses in these subjects in the college and the university the same as the aims of the courses in the same subjects in the secondary schools. In the nature of things they can not be identical. Nor are they so nearly the same as to justify the transfer of matter and methods usually practiced.

The fact that the so-called Type Method or some modified form of it is so extensively used in secondary schools, can be accounted for on the grounds, (a) that it affords a definite plan of procedure, and (b) that the higher institutions, both in the training of teachers for secondary schools and in their entrance requirements, stated or implied, have unmistakably emphasized the study of types. As to a definite plan no emphasis can make more evident the order of the work. Nature provides the types, and the teacher finds it much easier to attempt to follow in the path marked out by Nature and taught in the advanced courses than to attempt any other methods. It necessarily follows that the method dominates the work, instead of the work dominating the method. It is too common a thing to find students from secondary schools who "know all about the starfish" but

do not know a mosquito larva, its habits, and the part they play in relation to man's welfare.

Often this plan of teaching is followed so closely that students are led to look upon nature as existing for the one purpose of setting forth by types the development of the higher forms from the lower,—evolution. Rather should they be led to regard nature in a true light lying all about them full of hidden meaning and replete with forces for good or for evil; that it is necessary to know nature so completely that we may obtain the good and avoid the evil.

Again it is a question whether students in secondary schools have sufficient knowledge and experience and power of association to make the study of types the basis of their work. They may get much good from such study, but may they not get greater good by devoting a larger amount of attention to a broader view of the subjects than that obtained, when the attention is centered too strongly on types.

The foregoing considerations serve to show that the type method in its true meaning is not well suited to the needs of the students in botany and zoölogy in the secondary schools. The criticisms are generally considered to be well founded and yet our universities continue to announce training courses especially for teachers in which the type forms are studied in the usual way.

If we turn in search of the best work which is being done in these subjects in the secondary schools, we find it where the teachers in charge of the work have had the good sense, opportunity and skill to work out of their own and others' experience, methods based on the true needs of the students at their particular stage of advancement, meeting them on the grounds of their greatest natural interests and proceeding from these toward a better knowledge of those things they should know and want to know. By whatever means,—summer courses, teaching leaflets, or any other opportunities,—these conditions can be extended, they should be sought out and made use of.

What is the nature of the work which contributes most largely and successfully to the best results from the larger point of view? Opinions may differ somewhat, but the demands of actual experience are in favor of a sane natural history. Unfortunately this term has been so variously used that its meaning may not be clear. Here it may be taken to mean finding out what a thing is, what work does it do in nature, and how it does that work, and its relation to man. Typical forms may be studied and their relation to related forms may not be omitted without distinct loss. Sane natural history clearly does not mean the compilation of the curious, startling and catching facts of nature calculated to draw out wonder and surprise and thereby increase interest in such things. Nor does it consist in collecting and naming all the specimens to be found within reach and getting acquainted with as many forms as possible without any meaning attached to them. Usually there is naturally demanded a large acquaintance

with many common forms, and the curious and unusual generally attract their due share of attention without special emphasis. The work should include a generous portion of those biological facts and problems which come into most vital relation to the student and to the community, and he should be led under proper direction to investigate these things largely for himself in order to realize more fully their true significance. This is natural study were it not natural history. It is likewise natural development for the students. It yields the highest possible educational value as well as practical value, and gives the best training for the future, no matter whether that future may be in the college or university or in any other course in life. It places him in a more nearly proper attitude toward his surroundings in life by directing his attention to those forms and forces in nature which may be of service to him if he will but find them out or which may do him great injury if he neglects that work. In such study he will learn to observe and to think on those things at hand and in a measure to correlate them with each other and himself. He is in the right attitude and on the right road. To place him here is the great work of the secondary schools.

Discussion on "Shall the Study of Botany and Zoölogy in Secondary Schools take the Form of Study of Type or of Natural History?"

MISS GRACE F. ELLIS, GRAND RAPIDS.

When I was asked to discuss the subject matter of these two papers, The Type-Study Method and The Natural History Method, in zoölogy and botany, I began to inquire of myself as to my own attitude toward these two phases of work, and then how I had arrived at this attitude. Perhaps I can best illustrate what seems to me to be the rational view first, and then explain how I have arrived at my conclusions in regard to it.

When a beginning class in zoölogy entered my laboratory this winter I did not offer them a slide of paramoecia and a compound microscope and set them to begin at the logical beginning of zoölogical study. The longer I teach zoölogy the more I am convinced that while the arrangement of ideas parallel to the scheme of evolutionary progression from the simplest animal to the more complex may be of value to the adult, it is not equally valuable to the beginner; the lowest forms are simple in structure but not in physiology, and the question of physiology is quite as important as structure to the beginner.

We commenced instead with a crayfish. But for an unfortunate accident each member of the class would have been provided with living specimens to avoid any objections to handling preserved material; as it was, preserved specimens were given out for individual study, but a sufficient number of live animals were kept in the aquarium to render constant reference to them possible. Usually, by the time a student had completed

his preliminary examination, gained a notion of general form, symmetry, structure, etc., learned the few new words necessary, and drawn the animal and its appendages carefully, he had spent sufficient time at the aquarium, either during laboratory periods, or before school, to become familiar with the crayfish's mode of locomotion, his ability to see, and to feel vibrations, his manner of eating and breathing, and is able to make some record of these processes from his own observation. He is encouraged to make any kind of legitimate experiment, and when the season permits to study them in their haunts and collect their discarded skins.

Boys, especially, are interested to examine and describe their holes, to keep them in home-made aquaria, and watch them moult, or to see the crows eat them and find how they break them open. Laboratory specimens for a large class seldom fail to show amputation and regeneration of appendages. Laboratory work is followed by a discussion of the energy manifested by the crayfish, its source, law of conservation and of what becomes of its food. Lessons are assigned from "Martin's Human Body" on "Why we Eat and Breathe," "Nutrition," etc. Comparison with the human body is always desirable, and if sufficient interest can be excited a brief study of the manakin, a comparison of the different ways of digesting food, etc., in crayfish and man, the use of the nervous system in the two, and the fundamental difference in the nervous system of man and crayfish are also taken up. The more important systems of internal organs may be worked out either in a crayfish or a lobster.

The fact that physiological processes are in the end referable to cells, leads to a brief study of a few cells in the important tissues of the crayfish, and so to a study of cell development which may be used as an introduction of the Protozoa, which in turn may be profitably compared with bacteria and the work of animals and plants discussed, particularly if the pupils have had botany.

At the conclusion of the five or six weeks of study spent on the crayfish I should like to have developed the various stand-points from which any animal may be studied—external structure with homologies and adaptations, internal structure and functions, division of labor, classification based upon resemblance of structures, distribution in space and time, development from the egg, ecology and habits. For assistance in this classification I am indebted to Lloyd Bigelow.

This, it seems to me, is a proper use of a type—to be succeeded by studies of other types; perhaps, not so extensively but with constantly enriched comparative studies and always with an idea to make them yield results in accuracy, power of thought, in independence of judgment which is the greatest attainment in the teaching of any science teacher.

The essence of biological method is comparison. To get ideas of morphology we must compare either animal or plant and their organs. To get ideas of relationship we must compare. To arrive at a notion of physiology we must compare the behavior of organisms.

I do not believe it is necessary to study many forms, to cover a large amount of ground, or even to take up a representative of every branch of the animal kingdom to accomplish this.

It is the quality of the work, not the quantity, which will yield the results sought for. Such a study may be as logical as geometry and as disciplinary as Latin. The various processes of scientific method should be brought into play; generalization, invention of explanation, test of explanation (by deduction), appeal to experiment, the need of a critical and unprejudiced judgment in reaching conclusions, revision of work, and suppression of judgment in doubtful cases.

There is danger that type studies will lead to the idea that all forms will conform wholly to the type, and to a desire if they do not conform, to make them do so. Perhaps this may be met by broadening and enriching the side trips, the comparisons, and by numerous illustrations.

Within certain limits I do not think it makes so much difference what form is studied; but laboratory exercises must be grouped around a type specimen—a something which is definite, tangible, concrete—in so far a type; other forms are compared with this to show how related forms differ; but any form of animal ought to teach theoretical processes of life.

Now, if I may suggest what sems to me the ideal relationship between Natural History and Type Study, it would be that Nature-Study, presenting the natural history of common animals and plants be given in the grammar grades, where training of the observational powers and the formation of clear mental images may be given. Something of this is now done along the line of geography. If such grammar school study could deal with the more obvious and interesting phases of the economic value of animals, it would be of value not only to the future student of zoölogy but to the future citizen.

The ubiquitous English sparrow is an excellent subject for an introduction to the economic study of birds; and since this work is not done in grammar schools it should be done in the high school.

In fall classes, insects offer the largest field for economic study. The pests of orchards, gardens and shade-trees are easily obtained, pass through their changes quickly, and their habits of feeding can nearly always be demonstrated. Very few people have any knowledge of their biological environment, and this will never be remedied until the "enchanted country is open to children."

The strictly Natural History Course is here extremely suitable in presenting the external form, classification, movements, habits and life histories. This is not the thing of most value to the high school student, where internal structures of some animals are necessary from a physiological stand-point. In this respect the Natural History High School course is inadequate. Bigelow says, "It gives a view of animal life which is almost as limited, even if more interesting than the anatomical work which it is planned to supplant."

When the study of vertebrates is reached, the rise of the type-form becomes even more evident than before. Around this type may be grouped some of the wide range of modifications brought about in vertebrate structure, the homology of man with other vertebrates, and if desired the study of evolutionary development. None the less does the vertebrate type offer a series of natural history studies along economic lines most valuable to beginners. The economic study of birds has been mentioned.

Fish hatcheries and their value, fur-bearing animals, domesticated animals, game and game laws are a few of the various side-trips which may profitably be made.

Discussion on "Just Claim of Biology in Secondary Education."

PROFESSOR W. E. PRAEGER, KALAMAZOO COLLEGE.

At this late hour I will not comment in any detail on the excellent paper we have just listened to. Dr. Caldwell has told us the proper place for biology in the High School, now the question is how to obtain for it proper recognition. Biology is the newest and the largest of the sciences and it is no wonder it has as yet not found its proper place nor received the recognition it deserves.

We must demand full liberty for the development of our science and especially a square deal from colleges in the matter of entrance requirements. In this respect the University of Michigan is taking an extraordinary position. As far as I know it is the only State University that demands physics while biology is an option, thus in the schools of this state biology has to wait till all the demands that the department of physics may choose to make are fully satisfied. The absolute requirement of four years of mathematics and physics is most unusual and is very unfair to the biologic and earth-science groups. It seems to be acknowledged that the study of biology is backward with us as compared with neighboring states. A glance at the entrance requirements of such universities as Chicago and Wisconsin when compared with those of our own university will explain the reason.

We are too timid in demanding our rights. We do not give enough emphasis to the wide bearings of the science nor relate biology to other subjects. We must claim an equality with any other subject in the High School curriculum. Biology is more fundamental than the humanities, on a knowledge of nature is founded all our healthiest literature, all our noblest art. On biologic principles most of our social and economic questions ultimately depend. The health and wealth of our nation are alike mainly biologic problems. Man being an animal, biology is related to all that concerns man.

COMMERCIAL CONFERENCE.

CONTACT OR CONTEXT? SOME EXPERIMENTS IN COMMERCIAL EDUCATION.

W. W. WARNER, SAGINAW.

When I was asked in January if I could furnish for this section a brief paper on some subject relating to commercial education I was told first of all "to take my choice of a subject," and secondly, "to take a subject which," from my standpoint, "is of high value."

In replying, I said it would be a pleasure to me to meet the commercial teachers of this state in a section of the Schoolmasters' Club, and asked if it would be all right for me to "say my little say" on the subject of "Economics," as that seemed to fulfill the two conditions imposed:

First—To make my own choice.

Second—To take a subject, which, from my standpoint is of high educational value.

In a very prompt response I was told that my choice of a *subject* was acceptable, but that the *title,* "Economics," was a word that needed fumigating before going on the program. "Couldn't I sprinkle some cologne on it, or select a different title"?

I thus found myself in a position much like that of the preacher who was much perturbed by the women of his congregation adopting a new style of dressing their hair. This innovation was a departure from the habits of severe simplicity demanded by their faith; moreover, it obstructed the view of that part of his audience that in our day has come to be known as "mere man"; and it turned the heart of the wearers to vanity. So the good man formulated his views upon the new style and wrought out a sermon. But he could not give his sermon without a text. He had a *pretext,* the new mode furnished *that,* but by long established custom he must also have a *real text.*

He searched his concordance and subject-index in vain. They failed to guide him to just the wording he wanted. Resorting at last to more primitive methods of getting a text, he prayed for guidance and opened the Book at random resolving to take the first verse his eyes fell upon. The passage was this, "Let him that is upon the house top not come down."

For a moment he was staggered. Then his eye flamed, his soul filled with exultation. He had indeed his text. Going into his pulpit he delivered a scathing sermon from the last four words of the verse, "Top-knot, come down."

Happy, indeed, shall I be if you find the relation between my subject-matter and my "text" as close as this.

The reports of the United States Commissioner of Education contain many significant facts for those who can study them without getting bewildered, which I am free to confess I cannot always do. One of the most significant of these facts for our purpose to-day is the showing made in the report of 1906 that the "commercial schools" of this country stand as high in the list of expenditures as professional schools of all other sorts.

That is, as much money is spent for commercial education in the United States as is spent for law and dentistry, medicine and the ministry combined.

This little graph which I hold in my hand shows clearly the relative amount spent in the United States for the following purposes:

1. Schools for the defective..... 7½ millions.
2. Normal schools ..... 6¾ "
3. Reformatory schools ..... 5 1-3 "
4. Professional schools ..... 3 "
5. Commercial schools ..... 3 "

Public schools, 300 millions.

Universities, technical schools and colleges, 45 millions.

This statement shows what the schools of this country are now doing, or at least how much is being spent, for education along commercial lines. This expenditure of money along these lines is a matter of comparatively recent growth.

Commercial education has not always been a matter in which schools and school men were interested. In fact it is the generation of which we are a part, and the one immediately preceding this, that has seen the devlopment of the commercial school, and the commercial phase of public education.

If I ask you to go back with me in commercial history to the days when the Italian City Republics controlled the waters of the Mediterranean and regulated the traffic between the East and the West; to the days when the Hansa and other German leagues were trying to make safe the highways of northern Europe and the water-ways of the Baltic and the North sea, we are then at the beginning of a period when commercial education was purely a matter of *contact* with life.

The principles of bookkeeping as we now have them were being evolved by the Lombards in Italy, but books and the contents and the context thereof afforded no difficulties to commercial students for the same reasons that there are no railroad accidents in Iceland. There was then as now commercial work and commercial training, but none of it was dug out of the printed page. It was all dug out of life.

The aspirants for commercial training who went up from Hamburg and Lübeck, Zurich and Nürnberg, from the four quarters and the allied cities of the Hansa to serve as commercial apprentices in the factories of the League at London or Bergen or Bruges or elsewhere, had to pass as their entrance examination, we are told, "the cruel ordeal of the fire, the smoke, and the scourge." That is, it was well looked to that the candidate

for commercial training should be strong physically, and that he should enter the service in a proper state of subordination.

The apprentice had to serve for at least ten years, his life was one of rigorous and severe training, but he was gradually promoted (very gradually, our young people would think) through the various stages of commercial science, not the least important of which was his training in how to make a sharp bargain, and how to cheat the customs. Both of these practices were vital to his existence as a merchant in that day. They are still indulged in to a moderate extent in our day and not entirely as a matter of recreation. They are not, however, especially advertised in any curriculum, so far as my observation goes, and survive largely as a matter of inheritance, or of agility in dodging the "big stick."

At the end of his apprenticeship the Hansa trained clerk left the factory where he had served his time and returned to some German city to practice commercial pursuits and to make one of the constantly growing burger class whose wealth and sturdy spirit were to be stones in the road of feudalism which were to give that institution a jolt in its declining years.

Do you remember that little picture we have, given by H. de B. Gibbins in his History of Commerce in Europe, of the burgomasters of Ghent, Ypres, and Bruges going up to Paris in 1351 to pay homage to King John? If so, you will recall how the King received them with what he and his Court thought was sufficient pomp and ceremony. But somehow the burgers were dissatisfied and they showed it.

At the great banquet which was provided in their honor, their seats at table were not provided with cushions. To show their dissatisfaction at what seemed to them a lack of due consideration, they took off their rich cloaks all covered with costly embroidery and sat down on them as cushions.

After the banquet they rose up and left these cloaks behind them as they went out. Some one of the Court, thinking they had forgotten them, reminded the burgomasters of the rich garments they had so carelessly left, whereupon Simon van Eertrycke of Bruges answered scornfully, "We Flemish burgers are not wont to carry away our cushions after dinner."

Here was the pride of the masters of business asserting itself against the pride of the cult of birth.

It might be observed in passing that the "souvenir habit," so rampant in our day, had not then apparently broken out. This is to be regretted, for it would be interesting to know if, under like conditions, the commercial Flemish, like the commercial American, would not only have taken his own cloak, but also the table service of King John and the chamber linen of the Paris inn-keepers?

Be that as it may, I have referred to them as a type of those who got their commercial training by *contact* with the world and not from the *context* of books about the world. They were severely trained, strong, independent, masterful men. And their history shows that their commercial instincts were fully as strong as were those of a young American I recently heard of.

This young man, after passing through a commercial school and serving for a time in a subordinate place in a large clothing firm, was started out on the road to try out his ability as a traveling salesman. He was given the usual outfit and instructed how to show up his line.

Finally the manager placed in his case one special suit with these instructions, "This suit is only to be shown as a last resort. After you have fully shown your line, and developed its merits as you have been instructed how to do, if you have failed to interest your customer and secure an order then you may show this suit. But do not take any orders, or at least not very many orders, for it. We have placed a price on it of $10, but there is nothing in it for us. It is just put in to interest the trade if nothing else will."

At his first town, the young salesman, after some difficulty, got an appointment with his firm's customer and opened up his line. He did his best but he couldn't interest him. It is a heart-breaking job to talk to a customer who whistles, and looks out of the window, and shows in every way that he is not interested. Some of you people who have never done anything but teach school, and think that you have got the most difficult of jobs, should go out and try it once.

Failing in everything else, the young man at last brought out that final suit. The customer was at once interested. "There," he said, "that is something like it. That suit is really worth looking at. I could use two hundred of those suits, but not at $10." "I'm not taking orders for this suit," said our salesman, "this is simply a sample of what our men can turn out. But there is nothing in it for us." "Well, I can use a couple of hundred of those at $9."

"No use. I can only take a very small order for these, if I take any order at all, and the price is $10."

"I can use two hundred at $9. You telegraph the house and tell them what I say."

"But it's no use. I'm not allowed to sell many of these at even $10."

"But you telegraph the house. It won't cost you anything, I'll pay for the telegram."

The telegram was sent. In due time came a reply, "Accept the order."

The young man went on to the next town, secured his audience, and presented his line. He could make no impression. Resorting again to his last suit, his customer was at once interested. "That is a fine piece of goods and well made up. What are the terms on those?"

"Well," said the salesman, "I have now got a price of $9 on these, but we do not care to book orders for this line. They are made up at a loss, and even favored customers can only place small orders."

"I can use a hundred and fifty of those at $8," said the indifferent merchant. "You telegraph your house and tell them so."

"It's absolutely no use. We lose on every one of these suits that we sell for $9. I couldn't think of sending in a telegram like that."

"Telegraph in, it won't cost the house anything, I'll pay for the wire."

The telegram went in. The reply came, "Accept the order."

The young man packed his trunks and went to the hotel for the night. He was not feeling well and during the evening grew worse. The house physician was called, examined him carefully and said, "My friend, you are a very sick man. If you have relatives, they should be sent for at once."

"How sick am I, doctor, tell me the exact truth?"

"You may live until morning, you may last until tomorrow night. No one can tell exactly. Have you relatives?"

"No one, except a couple of second cousins and they do not care anything about me. We have not seen each other in a long time. Besides neither one of them could get here in time. One is in South America, the other on the Pacific Coast."

"Have you no intimate friend, then? Don't you want to send a message to someone?"

"I think not, doctor, unless it is to the house."

"Very well, what message shall I send for you to your house?"

"Wire them, Doctor, and ask them what is the very lowest price they will take for that $10 suit."

Now I have referred to actual fourteenth century burgomasters and to a mythical twentieth century salesman not entirely to entertain or to amuse you. The young salesman wanted *to know,* and the old burgomasters wanted *to have.* Everywhere and always we want *to know* and want *to have.*

What we want *to know* and *to be* fixes in a large measure our intellectual and spiritual life, and what we want *to have* and *to do* determines largely our economic life.

It is this economic life, and the study thereof, that I had in mind to speak of at this conference rather than the comparative merits of commercial education *in* or *out* of school, as illustrated by contrasting mediaeval and modern conditions; just as in the case of the preacher heretofore referred to it was fashion's innovations he wanted to talk of rather than of people who might or might not be upon house tops.

It is not many years ago that the commercial schools of this country were all mere schools of penmanship and bookkeeping, typewriting and stenography, with a little incidental spelling, arithmetic, and the like.

In response to public pressure, a place was found for these branches in the public schools. The thorough bred schoolman, imbued with conservative ideas of classical education, did not like this invasion very much and he does not like it yet, but the great "paying public" compels him to submit to it, which he often does with an air of amused toleration.

The growing efficiency and importance of the commercial school and the commercial department of the public school, as indicated by the graph I showed earlier, has made necessary in many localities a gradual extension of the commercial curriculum.

It is my feeling that this extension of the curriculum makes it necessary to test and try out with considerable care the real value of each new study added to the list. Economics is one of these studies, and for eight consecutive years now we have been experimenting, testing, and watching results in our school and community.

As a result of this experience I come to you with certain tentative conclusions. I submit them here, not because any considerable number of you are personally engaged in teaching this subject, but because it is a subject that lies distinctively within our field, and because in my own work I have found the Economics class the most satisfactory place to round up certain principles that have earlier in the course been touched upon in commercial geography, commercial history, bookkeeping, and law.

To most of my pupils, as to most of yours, the high school course, or its equivalent, is a finishing course. The secondary school is their finishing school. Whatever views of life the pupil takes with him from school into business the last impress of the school is the impress we leave upon the senior class.

Our graduating class in the Saginaw high school this year will be between 110 and 115 pupils. Our Economics class enrolls 52 pupils, a trifle less than 50 per cent of the entire senior class. What are we teaching in Economics, as the result of eight years of experimentation?

Well, first of all, we have not taught them for any two consecutive years, exactly the same things.

For you must notice that Economics is not an exact science. It is essentially inexact, for it is founded upon something that is always fluctuating, always shifting. It does not rest on bed rock in the sense that mathematics, or physics, or chemistry do, which rest on nature's fixed modes of action. It rests for its basis on your nature and my nature, your wants and my wants, and these are constantly changing.

Secondly, we have not taught them what we should probably have to teach them if they were all going to Michigan, or some other university, and university men fixed the requirements. Not that we have taught them anything *better,* we have simply taught them something *different* because we believed it would do them more good. I will illustrate this presently.

Thirdly, we have not taught them all there is in any book, published, unpublished, or to be published. You may, and probably do know, that the early English economists in developing their science made the mistake of assuming that the facts of the business world were so complex and intricate that they could not be classified. They founded their science largely on assumptions. They assumed that man was an economic animal: in their day that meant the assuming that all men were governed by the desire to get rich: and that every man would necessarily sell in the dearest and buy in the cheapest market. Living altogether in their studies, they did not think it necessary to go into the markets, into the fields, into the mines, into the factories, and there investigate the processes of production and

exchange, in order to arrive at the laws governing prices, wages, profits, rents, and rates of interest through the study of *facts*.

They developed deductive political economy. Having established their laws they thought the facts should fit them. It did not occur to them that their laws must fit the facts. They therefore developed a political economy which applied to no country and to no people that had ever been in existence.

We have therefore spent no time studying the text, or the *context*, of the "Classical School" of economists.

Fourthly, we have not attempted, with pupils of a secondary school, to do any "original observation" work with the idea of adding to the world's stock of knowledge. But pupils *have* done some original observation work with the idea of adding to their own knowledge, and contributing their quota to the class. This will be referred to again.

Having stated thus broadly some things that *have not* been done, let me indicate briefly, as well as I may, some things that have been done.

When a pupil enters an arithmetic, a bookkeeping, or a stenography class he has, within certain pretty definite lines, an idea of just what he is to study: that is, he has absorbed from the fund of general information in which he lives a substantially correct impression of what he is about to learn in detail.

The average pupil enters the economics class, however, with but the most vague conception of what it is to be. This is not strange for he has lived in an atmosphere of most indefinite ideas, so far as general information goes, as to what grounds economics really covers. This is not to be wondered at when economists themselves are not all agreed on where their ground ends and the territory of other sociological subjects begins.

So, with the secondary pupil, the first thing to do is to connect this new study with something he already knows.

Instead of starting in by telling him, for instance, that "Economics deals with wealth, and nothing but wealth, and that this warning should be carefully heeded," as our friend Walker does; suppose it is pointed out to him that just as the lawyer has to do with the *rights* of men, just as the moralist deals with the *duties* of men, so the economist handles the *wants* of men.

The student already knows from his studies in commercial geography and commercial history that the primary wants of men are the want for food, the want for clothing, and the want for shelter. His attention has been directed to the fact that the want for these things drove man to acivity and that his first activity, or occupation, by which he satisfied his wants, was the occupation of a hunter and a fisher.

He knows that in this day man is not an animal of one occupation but of many occupations. He perceives that these thousands of occupations have one common end, and that end is the same as when man had but one occupation—the satisfaction of his wants.

The student then easily grasps the thought that, from the point of view

of this study, man was capable of civilization because he was an animal of expanding wants. That therein he was different from the other members of the animal kingdom who all still want pretty much what they did in the days when man's wants, like theirs, was confined to food and shelter.

The student perceives that this expanding want made necessary increased ability in satisfying the want, and this led to diversified activity: that is, to the growth of occupations. He is then face to face with one principle which we say characterizes the economic world in which he lives, and that is the principle of the division of labor. This principle sets aside in our body industrial and commercial, either by force of law, or more commonly by force of circumstances, or of will of the individuals, certain people to perform exclusively certain social functions. And so the welfare of our body economic rests upon the final harmonious out-working of all these different occupations.

He discovers that once the maker of boots also made other articles of apparel, but that in his day the business of making boots is divided into thirty different occupations in each of which certain individuals occupy themselves, we may practically say, for their entire lives.

We set aside the business of curing people by the administration of drugs to a peculiar class in the community, and we prosecute anybody who undertakes to prescribe without having the recognition of the community. In like manner we set aside certain people for the cultivation of the law, and others for the cultivation of theology.

Thus our present manner of living leads to mutualism: that is, to dependence upon each other. Nowadays, especially in city life, "The water main is my well, the trolley car my carriage, the banker's safe my old stocking, the policeman's billy my fist. My own eyes and nose and judgment defer to the inspector of foods, or drugs, or gas, or factories, or tenements, or insurance companies." The student will easily see that he must soon, as his parents do now, "rely upon others to look after his drains, invest his savings, nurse his sick, and teach his children."

His father is more dependent than his grandfather was, and he himself is to be more dependent upon the social order than his father now is.

This progress of the economic order toward mutualism puts us at one another's mercy and thus makes possible a multitude of new forms of wrong-doing that he will not read about in the Old Testament.

Since his health and life are at the mercy of the inspectors of meats, milk, sewers, and a hundred other occupations, he wants dependable men in those occupations. And what he wants in others he must, because of this mutuality of the economic order, supply in himself. Therefore as a first commandment in his new decalogue he should write, "Thou shalt be dependable."

The student will now be interested in finding an economic basis for the multitudinous occupations which he sees originating in the constantly expanding wants of man.

When he discovers that he can watch a great crowd thronging in apparent chaos along a street, as for instance on circus day, and pick out here a farmer (and he delights to do that), and there a miner, and again a mechanic, or a minister, or a lawyer, or a laborer, or a school teacher (and this I am well aware makes some of the ladies shudder), and there a beggar, and so on; and when he finds that all these thousands of people with their hundreds of occupations can be reduced to seven economic groups the student is pleased, for he is beginning to see that there is economic order in all this apparent chaos and this satisfies his instinctive desire for mental order.

When he finds that all occupations can be reduced to well defined groups, and understands the basis of this grouping, he is then ready and willing to make a study of all the people in his block or neighborhood and classify their occupations from this economic basis. Or he is ready to take the city directory and classify the occupations of all the people whose names begin with the same letter his name does, or any similar exercise that would bring him in contact with his community life.

With this matter well in hand he is then quite willing to make a careful study of some one of these occupations thus classified, and contribute to the class detailed information of what he has learned about it.

I hold in my hand a six page article of this character. It was written by a high school girl, one rather fond of festivity and not much given to thinking of the individual's duty to the social organism.

But after discovering, in classifying the occupations of the people in her neighborhood, that a man in the same block was a sidewalk builder, and after making a detailed investigation of what was in a day's work of sidewalk building, she saw in the man a creator of utility, and in the walk a thing of want satisfying power, and in that respect a thing allied to the comfort of community life, and a thing of quite as much importance as a new bracelet or a party dress.

I wish I had time to read you this study. I am quite sure there is not a person present who could have told the class as much about sidewalk building as this miss was able to do by opening her eyes to what was in her own block.

It would be a trespass upon your time and patience for me to go on elaborating exercises in the various divisions of economics as I have been perilously near to doing in the last few minutes.

The point I am trying to make clear is that in the secondary schools, according to my judgment, economics should not be made entirely a study of texts, or chiefly a grind to understand the *context* of any particular book.

It should have connection with what has preceded it in the curriculum and it should have *contact* with the community where it is being taught.

With another illustration I will close.

In the study of occupations the student has really been studying man as a producer. He finds that his neighbors are often doing much hard,

dirty, and often very disagreeable work and he has always thought of them as working for money. His thought is now directed, perhaps for the first time to the fact that these people do not eat their money when they are hungry, nor wear it when they are cold, nor live under it in inclement weather.

Always they turn the money into something else, and it is this something else that they really put forth their effort to obtain. That is, they undergo the pains of production in order that they may derive the satisfaction of consumption.

While studying this division of economics last fall I submitted to my class a problem that had grown to be a very vital thing to a previous member of the school.

I said to the class one day, "There is a young man in this city, a graduate of this school, whom I will call A because if I use his real name some of you may know him.

He is now getting $15 per week and since leaving school he has saved $400. He is very anxious to marry and have a home of his own. The girl he wishes to marry is also a graduate of this school and was a member of his class. Her parents are in moderate circumstances, she is used to a plain though comfortable home.

A thinks that his $400, with what his intended wife will have, will be sufficient to comfortably furnish them a modest home and that his salary will be sufficient for them to live upon.

Now you have been studying some statistics about family incomes in Germany, France, England, and the United States, what items these incomes go for, and the relation of these incomes to the standard of living.

You have run across the formulated statements known as Engel's law, drawn from these statistics, and now I want you to answer these questions about A.

1. Basing your figures on Engel's law, how much may A, with his income properly pay per month for rent?
2. To what sum should his average monthly bill for fuel be limited. How much for light?
3. About what should his grocery and meat bill amount to per month?
4. What may he and his wife properly spend per year for clothing? How should this amount be divided between them? that is, what part of the yearly allowance for clothing should A spend on his own clothes, and what part should be spent by the wife?

Perhaps no question that I ever asked in class aroused a more animated discussion than did this.

When A gets to earning $100 per month, as his employer privately told me he probably would be earning within the next three of four years, if he should agree with his wife that every month she should have her allowance as certainly as he had his, and it was agreed that she should do all the buying for the household (except the rent, fuel and light bills, and the

bill for A's own clothing) and it was agreed that he was to have one-third the proper expenditure for clothing, and she to have the other two-thirds, and she was also to have $10 per month for her discretionary use, what monthly allowance should A pay his wife under this agreement?

Base your figures on Engel's law.

When they found out, in answer to question one, that with A's present income he could not pay over $10.25 for rent, then a committee could be appointed if necessary to find out in what part of the town houses could be rented for $10.

How many rooms, and what accommodations a ten dollars a month house had? How does the housing accommodations that can be had for $10 compare with the standard of living that the young people are already accustomed to?

How does a house that can be rented for $10 a month in Saginaw compare in desirability of situation and conveniences with houses that can be rented for $10 a month in any other town that they know about?

What makes this difference?

Do wages and salaries in different towns vary as widely as house rents do? Why?

Do interest rates in different town vary as much as wages and rents? Why?

These questions and illustrations will make sufficiently clear, I trust, the difference between the two modes of attack that I have dubbed "Contact" and "Context." They also cover the points that I said, earlier in my talk, would be referred to again.

No other study that we have in our commercial curriculum gives the wise and experienced teacher a better opportunity to press home upon his class the real nature of the social environment in which our lives are now cast.

The pupil comes to see with a good deal of clearness that more and more the progress of our civilization is toward mutualism.

More and more we are all linked in complex relations, and every new relation tends to become a fiduciary relation. And every new fiduciary relation is a fresh opportunity for others to betray us or for us to betray others. The evolution of society evolves new forms of sin and we cannot avoid committing these sins unless we know what they are.

The essence of wrongs to society when the decalogue was written was aggression and violence; the essence of wrongs that infest the social order in our day is the betrayal of trusts. The opportunities presented by our webbed social life have been seized unhesitatingly in the name of business by men who do not realize the infamy of the treasons that they commit.

And so we have the man who "picks pockets with a railway rebate, murders with an adulterant instead of a bludgeon, burglarizes with a "rake-off" instead of a jimmy, cheats with a company prospectus instead of a deck of cards, and scuttles his town instead of a ship. "And this man is often

your friend and mine. He does not feel upon his brow the mark of the malefactor because he and his associates perceive but dimly, or not at all, the real nature of the economic order in which we live.

I would not have you think that I regard the present social order as all wrong, or even as rotten at the core.

On the contrary I think there were never before in business life so many well meaning and well acting participants in the economic order.

But I do think that it is incumbent upon us who are training young people for commercial and other forms of business life to call their attention to the fact that it is possible for them to commit sins that their forefathers could not have committed even if they had been so disposed. That the type of charcter that might have been ideal when Moses led the Jews out of Egypt, or even when the Pilgrims landed on Plymouth Rock, is not sufficient for the mutualistic economic order of our day when most sin is "preying," and each new social relation makes it possible to practice a new form of cannibalism.

SYNOPSIS OF BUSINESS MEETING

High School Hall, April 3, 1908.

The meeting was called to order by President Wm. A. Greeson. The minutes were read and approved. Reports were made by the Secretary, the Treasurer, and the Auditing Committee.

FINANCIAL REPORT OF THE SECRETARY AND TREASURER FOR 1907.

Receipts.

March 1, 1907	Balance on hand	$ 89 71
March 30, 1907	Deposited dues and receipts	361 00
April 6, 1907	Deposited dues	4 00
April 15, 1907	Deposited dues	5 00
July 2, 1907	Deposited dues ($20 in Com. and $20 in Savings)	40 00
July 8, 1907	Deposited Ads	22 00
Aug. 7, 1907	Deposited Ads	194 52
Sept. 4, 1907	Deposited from Sale of Journal	70 00
Feb. 15, 1908	Deposited from Sale of Journal	50 00
Feb. 29, 1908	Deposited Ads $12.65; dues $2.00	14 65
Total receipts		$850 88

Disbursements.

March 14, 1907	Check No. 57, for postage	$ 10 00
March 19, 1907	Check No. 58, for postage	6 00
March 30, 1907	Check No. 59, to Professor Mann	12 60
March 30, 1907	Check No. 60, to Dr. Stratton	30 00
March 30, 1907	Check No. 61, to Professor Smith	8 74
March 30, 1907	Check No. 62, to L. P. Jocelyn	100 00
April 4, 1907	Check No. 63, for Janitor	1 00
April 6, 1907	Check No. 64, for bill posting	3 80
April 6, 1907	Check No. 65, for Janitor	3 00
April 6, 1907	Check No. 66, for moving piano	4 00
April 6, 1907	Check No. 67, for clerk hire	3 45
April 10, 1907	Check No. 68, for postage	3 00
April 13, 1907	Check No. 69, for postage	3 00
April 13, 1907	Check No. 70, for clerk hire	60
April 15, 1907	Check No. 71, for printing	75 75
April 15, 1907	Check No. 72, to Professor Miller	15 00
April 15, 1907	Check No. 73, for clerk hire	14 90

April 15, 1907	—Check No. 74, for musical program	5 50
April 22, 1907	—Check No. 75, for Stereopticon lecture assistant	4 00
June 1, 1907	—Check No. 76, for postage	2 00
June 11, 1907	—Check No. 77, for postage	21 00
June 21, 1907	—Check No. 78, for printing	125 00
June 21, 1907	—Check No. 79, for city delivery	50
July 3, 1907	—Check No. 80, for postage	1 00
July 8, 1907	—Check No. 81, transfer to Savings Dept	20 00
Aug. 1, 1907	—Check No. 82, for miscellaneous	12 05
Aug. 5, 1907	—Check No. 83, for advertising expenses	117 12
Aug. 20, 1907	—Check No. 84, for printing	100 00
Oct. 27, 1907	—Check No. 85, for express	1 25
Nov. 23 1907	—Check No. 86, for printing receipts	1 50
Jan. 18, 1908	—Check No. 87, to Professor C. B. Williams	6 00
Feb. 12, 1908	—Check No. 88, for postal cards	2 50
Feb. 29, 1908	—Check No. 89, for printing in full	71 80
Total Disbursements		$786 06
Total Receipts		$850 88
Balance		$ 64 82
In Savings Department		20 00
Total amount on hand		$ 84 82

REPORT OF THE AUDITING COMMITTEE.

We have examined the reports of the Secretary and Treasurer and find them correct.

W. B. Sloan,
R. R. N. Gould,
Auditing Committee.

NOMINATING COMMITTEE.

Appointed Thursday morning, April 2.

J. B. Davis, representing the club at large—Grand Rapids.
J. R. Bishop, representing the club at large—Detroit.
L. P. Jocelyn, representing the club at large—Ann Arbor.
G. R. Swain, representing the Classical Conference—Bay City.
Jessie Gregg, representing the English Conference—Kalamazoo.
T. P. Hickey, representing the Mathematical Conference—Battle Creek.
E. A. Strong, representing the Physics and Chemical Conference—State Normal.
W. P. Holt, representing the Biological Conference—Toledo, Ohio.
C. S. Larzelere, representing the History Conference—Central Normal.
Moritz Levi, representing the Modern Language Conference—University.
Left open—Commercial Conference.

REPORT OF THE NOMINATING COMMITTEE.

President, L. H. Jones—State Normal College.
Vice-President, Edith M. Kimball—Detroit.
Secretary, Louis P. Jocelyn—Ann Arbor.
Treasurer, John P. Everett—Mt. Clemens.

Chairman of Classical Conference—F. W. Kelsey—University.
Secretary of Classical Conference—Edith E. Atkins—Lansing.
Chairman of Physics and Chemistry Conference—W. D. Henderson—University.
Vice-Chairman of Physics and Chemistry Conference—M. A. Cobb—Lansing.
Secretary of Physics and Chemistry Conference—DeForest Ross—Ypsianti.
Chairman of Mathematical Conference—J. L. Markley—University.
Secretary of Mathematical Conference—Albertus Darnell—Detroit.
Chairman of Modern Language Conference—A. G. Canfield—University.
Secretary of Modern Language Conference—Emelia Hochstein—Kalamazoo.
Chairman of History Conference—A. L. Cross—University.
Secretary of History Conference—Mary Hinsdale—Grand Rapids.
Chairman of English Conference—Cornelia S. Hulst—Grand Rapids.
Secretary of English Conference—Sara Whedon, Ann Arbor.
Chairman of Biological Conference—S. D. Magers—Normal College.
Secretary of Biological Conference—Mary A. Goddard—Normal College.
Chairman of Physiography Conference—W. H. Hobbs—University.
Secretary of Physiography Conference—W. H. Sherzer—Normal College.
Chairman of Drawing Conference—Emil Lorch—University.
Secretary of Drawing Conference—C. S. Denison—University.
Chairman of Commercial Conference—D. W. Springer—Ann Arbor.
Secretary of Commercial Conference—Gertrude O. Hunnicutt—Lansing.

Mr. Everett, Treasurer of the Club for the last six years, asked to be relieved from the duties of that office, and suggested that the positions of Secretary and Treasurer be combined into one. Mr. Everett's resignation was accepted and his suggestion carried out, and L. P. Jocelyn was made Secretary-Treasurer of the Club.

Professor Winkler of the University asked the Club to appoint a committee to look into the methods of teaching modern languages in Michigan. The Club gave the Conference of Modern Languages power to appoint such committee.

Professors Lorch and Denison, a committee from the university, spoke upon the desirability of the high schools doing more work in drawing and thus relieve the university from doing much elementary work in that line. The committee asked that a Conference of Drawing be organized by the Club so that the matter could be brought before the teachers of the state. The committee was given to understand that such a conference would be organized.

PROGRAM OF GENERAL SESSIONS

Thursday Morning, April 2
9:00 o'clock

UNIVERSITY HALL

*General Topic:—Formal Discipline in the Light of Modern Psychology.

1. The Bearing of General Psychological Principles upon the Doctrine of Formal Discipline,
   Professor James R. Angell, University of Chicago.
2. Effects of General Training upon Memory,
   Professor W. B. Pillsbury, University of Michigan.
3. Training in Special Subjects as Related to General Intelligence and Capacity,
   Professor Charles H. Judd, Yale University.
4. Open Discussion.

Thursday Afternoon
5:00 o'clock

HIGH SCHOOL AUDITORIUM

Musical Program—By members of the Faculty of the School of Music.

(Free to persons holding membership tickets.)

Thursday Evening
8:00 o'clock

HIGH SCHOOL AUDITORIUM

Address: History and Geography,
Professor George Lincoln Burr, Cornell University.

(Free to persons holding membership tickets.)

At the close of the address, a short reception will be held.

* This discussion will be published in the *Educational Review* for June.

Friday Morning, April 3
9:00 o'clock

HIGH SCHOOL AUDITORIUM

General Subject: History in the Schools.

1. The History Problem from the Point of View of the Public High School,
   Miss Mary Hinsdale, Detroit Central High School.
2. History from the Point of View of the Elementary School, Principal Charles L. Spain, Detroit Normal Training School.
3. Principal Findings of the American Historical Association's Committee of Eight on History in the Elementary Schools, by the chairman of the committee,
   Professor J. A. James, Northwestern University.
4. Discussion, opened by Professor Richard Hudson, University of Michigan.
5. Business meeting.

Friday Afternoon
4:45 o'clock

BARBOUR GYMNASIUM

Young Ladies' Classes in Gymnastic Drills, and Basket Ball Game.

(Free to persons holding membership tickets.)

Friday Evening
8:00 o'clock

SARAH CASWELL ANGELL HALL

Address: Wit and Wisdom of Herodotus,
Professor Maurice Hutton, University of Toronto.

A short reception will be held after the address.

PROGRAM OF CONFERENCES

CLASSICAL CONFERENCE

Wednesday Morning, April 1

8:45 o'clock

All sessions held in Sarah Caswell Angell Hall, Standard Time.

Presiding Officer: Professor Martin L. D'Ooge, University of Michigan.

1. The Roman Forum in Cicero's Time,*
   Professor Walter Dennison, University of Michigan.
2. Quod and Quia: A Differentiation,
   Mr. O. O. Norris, Michigan State Normal College.
3. Collateral Work with Greek and Latin,*
   Miss Edith Emma Atkins, Lansing High School.
4. Discussion of Miss Atkins's Paper,
   Miss Gertrude F. Breed, Ann Arbor High School.
   Dr. F. O. Bates, Detroit Central High School.
   Professor J. H. Drake, University of Michigan.
5. Salissationes (Plaut. Pseud. 107),
   Professor Samuel Grant Oliphant, Olivet College.

11:10 o'clock

6. The Freer Manuscripts of the Bible,*
   Professor Henry A. Sanders, University of Michigan.

Wednesday Afternoon, April 1

2:30 o'clock

Joint Session of the Classical Conference and the Interdenominational Conference of Church and Guild Workers in State Universities.

Presiding Officer: President James B. Angell, University of Michigan.

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* Illustrated with the Stereopticon.

SYMPOSIUM*

on the Value of Humanistic, and particularly Classical, Studies as a Preparation for the Study of the Professions: THEOLOGY.

7. The Study of Latin and Greek as a Preparation for the Study of Theology,
   The Rev. President William Douglas Mackenzie, Hartford Theological Seminary, Conn.
8. The Value to the Clergyman of Training in the Classics,
   The Rev. A. J. Nock, of St. Joseph's Church, Detroit.
9. Short-cuts to the Ministry, with especial reference to the elimination of Latin and Greek from theological education,
   The Rev. Professor Hugh Black, Union Theological Seminary, New York.
10. Greek in the High School, and the Question of the Supply of Candidates for the Ministry,
    Professor Francis W. Kelsey, University of Michigan.

Wednesday Evening, April 1
8:00 o'clock

Presiding Officer: Professor Fred N. Scott, University of Michigan.

11. Lecture before the Classical Conference and the Philological Association of the University of Michigan· The Roman Theatre,*
    Professor Charles Knapp, Columbia University.

Thursday Afternoon. April 2
1:45 o'clock

Presiding Officer: Professor Joseph H. Drake, University of Michigan.

12. A Visit to the Battlefields of Caesar in Gaul, 1899,†
    Principal George R. Swain, Bay City High School.

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* This "Symposium" was published in the *School Review.* The Symposium upon "The Value of Humanistic, particularly Classical, Studies as a Preparation for the Study of Medicine and Engineering," at the Conference of 1906, was published in the *School Review,* Vol. XIV (1906), pp. 389-414; and that upon "The Value of Humanistic Studies as a Preparation for the Study of Law," at the Conference of 1907, in the same journal, Vol. XV (1907), pp. 409-435.

At the Classical Conference of 1909 there will be a Symposium on "The Value of the Study of Latin and Greek as a Preparation for Practical Life."

† Illustrated with the Stereopticon.

13. A Proposed Visit to the Battlefields of Caesar in Gaul, 1908,
Professor Walter Dennison, University of Michigan.

14. Latin and the Doctrine of Least Resistance,
Professor H. J. Barton, University of Illinois.

15. Why We admire Homer,
Professor A. M. Wilcox, University of Kansas.

16. *a.* Some Questions relating to Manuscripts of Livy,
b. The Roman Camp of Saalburg: Its Remains and its Restoration,*
Professor F. W. Shipley, Washington University.

17. On the Order of Words in Latin Prose,
Professor Clarence L. Meader, University of Michigan.

JOINT SESSION OF THE CLASSICAL AND MODERN LANGUAGES CONFERENCES

Friday Evening, April 3
8:00 o'clock

SARAH CASWELL ANGELL HALL

Presiding Officer: Professor Max Winkler, University of Michigan.

Address—Wit and Wisdom of Herodotus,
Professor Maurice Hutton, University of Toronto.

At the close of the Session those attending the Conferences are invited to come to the parlors on the first floor to meet the speakers of the Conferences and the officers of the Schoolmasters' Club.

MODERN LANGUAGE CONFERENCE

Wednesday Afternoon, April 1
2:00 o'clock

ROOM G, UNIVERSITY HALL

Chairman: Professor Frederick Lutz, Albion College.

1. Chamisso's Peter Schlemihl.
Mr. E. S. Lauer, Dennison University, Granville, Ohio.

2. Women in the Hero-Sagas,
Professor Grace Fleming Swearingen, Olivet College.

3. Ibsen and Norway,
Dr. Lee M. Hollander, University of Michigan.

4. Hôtel de Rambouillet,
Professor Moritz Levi, University of Michigan.

Thursday Afternoon, April 2

2:00 o'clock

ROOM G, UNIVERSITY HALL

Chairman: Professor Moritz Levi, University of Michigan.

5. The Educational Value of the Direct Method in the Teaching of a Foreign Language,
   Miss Lorley Ada Ashleman, Central High School, Detroit.
6. The Inductive Method of Teaching French Grammar,
   Miss Clara Wiggin, Instructor in the High School of Three Rivers, Mich.
7. Some Ideas on Teaching Pupils to Converse in French,
   Miss Elizabeth Gamble, Detroit Home & Day School.
8. One Idea of Teaching French,
   Professor James P. Bird, University of Michigan.

Friday Afternoon, April 3

2:00 o'clock

ROOM G, UNIVERSITY HALL

Chairman: Professor Max Winkler.

9. The Teaching of German Pronunciation,
   Miss Caroline Parker, Central High School, Detroit.
10. The Disciplinary Value of Modern Language Study,
    Professor Tobias Diekhoff, University of Michigan.
11. How Shall the German Teacher Keep Alive?
    Professor H. R. Brush, Hope College.
12. Some Experiments With the Language Phonograph,
    Professor Beziat de Bordes, University of Michigan.

CONFERENCE OF PHYSICS AND CHEMISTRY

Wednesday Afternoon, April 1

2:00 o'clock

PHYSICAL LABORATORY

Chairman: Professor N. F. Smith, Olivet College.

Secretary: Mr. DeForest Ross, Ypsilanti.

1. Some Sidelights in High School Physics,
   Dr. W. D. Henderson, University of Michigan.
2. A Stroboscopic Oscillograph,
   Professor E. C. Woodruff, James Milliken University.

3. The Content of the First Year College Course in Physics, Professor C. W. Greene, Albion College.
4. Discussion opened by Professor J. O. Reed, University of Michigan.

Thursday Afternoon, April 2

2:00 o'clock

PHYSICAL LABORATORY

5. The Adaptation of Laboratory Experiments to Local Conditions,
   Mr. H. B. Hendrick, St. Joseph.
6. The Teaching of High School Physics to Girls,
   Professor F. L. Keeler, Central State Normal School.
7. Discussion.
8. The Doctrine of the Siphon,
   Professor E. A. Strong, State Normal College.
9. Rumford's Value of Joule's Equivalent,
   Professor E. A. Strong, State Normal College.
10. A Simple Experiment with a Home-Made Electroscope,
    Mr. A. O. Wilkinson, Detroit.
11. The Application of a Stop-Watch in Laboratory Work,
    Mr. M. A. Cobb, Lansing.
12. A Mach's Wave Apparatus,
    Mr. C. W. Chapman, Agricultural College.
13. An efficient Home-made D'Arsonval Galvanometer,
    Mr. C. R. Weed, Olivet College.
14. A Teacher's Laboratory Note-Book,
    Mr. C. S. Cooke, Detroit.
15. An Experiment on Osmotic Pressure,
    Mr. L. V. Mann, Detroit.
16. An Experiment on the Sub-Cooling of Water,
    Professor N. F. Smith, Olivet College.

Friday Afternoon, April 3

1:30 o'clock

PHYSICAL LABORATORY, WEST ENTRANCE

Chairman: Professor B. W. Peet, Michigan State Normal College.

17. The Experimental View-Point in Chemistry,
    Professor Alexander Smith, Chicago University.

18. Some Simple Experiments in Agricultural Chemistry,
Mr. M. A. Cobb, Lansing High School.
19. Some Simple Apparatus for Teaching Electricity,
Mr. A. E. Parkins, Holland High School.
20. Preparation of Chlorine,
Mr. R. R. Putnam, Eastern High School, Detroit.
21. Some Criticism of the Work in Chemistry as Accomplished by the Students in the High Schools,
Assistant Professor David Lichty, University of Michigan.
22. Analysis of Soap Bark,
Professor W. S. Leavenworth, Olivet College.

MATHEMATICAL CONFERENCE

Friday Afternoon, April 3

2:00 o'clock

LECTURE ROOM, TAPPAN HALL

Chairman: Professor C. B. Williams, Kalamazoo, Mich.
Secretary: Dr. L. C. Karpinski, University of Michigan.

1. General Topic: How can the Teaching of Mathematics in the High Schools of Michigan be improved?
Professor J. L. Markley, University of Michigan.
2. Open discussion by the teachers of mathematics.
3. Approximations and Approximation Processes in Elementary Mathematics,
Professor E. R. Hedrick, University of Missouri.

HISTORY CONFERENCE

Friday Afternoon, April 3

2:00 o'clock

HIGH SCHOOL AUDITORIUM

Chairman: Professor Earle W. Dow, University of Michigan.

General Subject: Problems concerning the Teaching of History in the Schools.

A. Concerning Ways and Means.
1. Some Experience with Collateral Reading,
Mr. Frank Bacon, University of Michigan.
2. Discussion.

B. Concerning Subject-matter.
   3. Where should the Emphasis Fall?
      Professor Dana C. Munro, University of Wisconsin.
   4. Discussion:
   a. Points to be Brought out in the History Lesson,
      Mr. C. S. Larzelere, Central State Normal School, Mount Pleasant.
   b. Underlying Causes,
      Superintendent C. E. White, Mount Pleasant.
   c. Unifying Elements in English and American History,
      Miss Helen Johnson, Muskegon High School.
   d. Open Discussion.

C. The Report of the Committee of Seven.
   5. What changes in the report does experience call for? Open discussion.

ENGLISH CONFERENCE

Thursday Afternoon, April 2

2:00 o'clock

HIGH SCHOOL, ROOM C—3

Chairman: Mrs. Cornelia Hulst, Grand Rapids.
Secretary: Miss Mary N. Lowell, Kalamazoo.

1. Some Problems and Possibilities in Teaching of English Grammar,
   Miss Jessie Gregg, Kalamazoo.
2. The Necessity of a Review of Grammar in the High School,
   Miss Abigail Pearce, Normal College.
3. A Chapter in the recent History of English Grammar Teaching,
   Miss Gertrude Buck, Vassar College.

Friday Afternoon, April 3

2:00 o'clock

1. The English Course in the Saginaw High School,
   Principal Webster Cook, Saginaw.
2. A Substitute for the Classics,
   Professor F. N. Scott, University of Michigan.
3. "Readin' an' Writin',"
   Mr. Otto C. Marckwardt, University of Michigan.
4. Discussion:
   (*a*) Mr. J. F. Sheppard, University of Michigan.
   (*b*) Principal F. L. Bliss, Detroit University School.

JOINT MEETING BIOLOGICAL CONFERENCE AND SCIENCE TEACHING

Friday Afternoon, April 3

2:00 o'clock

SARAH CASWELL ANGELL HALL

Chairman: Professor S. D. Magers, Ypsilanti.
Secretary: Miss Ella Bennett, Ann Arbor.

1. Parental Care of Michigan Fishes (illustrated with lantern slides),
   Professor Jacob Reighard, University of Michigan.
2. The Just Claims of Biology in the Curriculum of Secondary Schools,
   Professor Otis W. Caldwell, University of Chicago.
3. Shall the Study of Zoology and Botany in Secondary Schools take the form of the Study of Types?
   Professor Nathan A. Harvey, State Normal College.
4. Shall the Study of Botany and Zoology in Secondary Schools take the form of Natural History?
   Mr. W. P. Holt, Central High School, Toledo, Ohio.

Discussion of second paper,
Professor Wm. E. Praeger, Kalamazoo College.

Discussion of third and fourth papers,
Miss Grace Ellis, Grand Rapids, and Professor H. M. McCurdy, Alma College.

General Discussion.

Teachers are requested to exhibit apparatus and present methods that they have found to be of interest.

COMMERCIAL CONFERENCE

Friday Afternoon, April 3

1:30 o'clock

HIGH SCHOOL

Chairman: President W. N. Ferris, Big Rapids.
Secretary: Julia DeYoung, Grand Haven.

1. Opening Address,
   President W. N. Ferris, Ferris Institute.
2. Context or Contact? Some Experiments in Commercial Education,
   W. W. Warner, Saginaw.

3. Christian Ideals in Commercial Life,
   Professor G. P. Coler, Ann Arbor.
4. Five-minute Talks,
   Business Arithmetic.
   The Handling and Correction of Transcripts.
   Commercial Geography.
   The Beginner in Bookkeeping.

Saturday Morning, April 4

8:30 o'clock

1. The Third Dimension in the Commercial World,
   Professor W. D. Henderson, University of Michigan.
2. Symposium—Methods of Teaching Shorthand.
3. The Needs of the Commercial Course,
   C. B. Bowerman, Detroit.
4. Round Table.

MEMBERS OF THE SCHOOLMASTERS' CLUB

LIFE MEMBERS

Denison, Walter

Kelsey, Francis W.

MEMBERS FOR THREE OR MORE CONSECUTIVE YEARS

ADRIAN
Curtis, A. E.
ALBION COLLEGE
Greene, C. W.
ANN ARBOR
Breed, Gertrude
Chute, H. N.
Hawkes, W. H.
Jocelyn, L. P.
Montgomery, Jabez
Porter Alice
Slauson, H. M.
Springer, D. W.
Sturgis, Martha
Whedon, Sara
Wines, L. D.
Essery, E. E.
Travis, Ora
BAY CITY
Swain, G. R.
Sharpe, E. M.
Stewart, J. A.
BATTLE CREEK
Coburn, W. G.
Hickey, T. P.
BENTON HARBOR
Farmer, Sara L.
Wright, W. R.
BIG RAPIDS
Green, Loa
CASSOPOLIS
Brown, J. M. C.
CHELSEA
Gallup, E. E.
CHICAGO, ILL.
Boyer, C. J.
Halsey, L. R.
Nutt, H. D.
COLDWATER
McElroy, E. M.
DETROIT
Arbury, F. W.
DETROIT CENTRAL
Adams, C. F.
Bartlett, A. E.
Bishop, Harriette A.
Bromley, Lillian M.
Bates, F. O.
Cooke, C. S.
Conover, L. Lenore
Darnell, Albertus
Frost, H. H.
Gee, E. F.
Goldman, Miriam
Irwin, F. C.
Mackenzie, David
DETROIT EASTERN
Bishop, J. R.
Kimball, Edith M.
McMillen, D. W.
Pettee, Edith E.
Struble, R. H.
DET., McMILLEN
Wagner, T. E.
DETROIT WESTERN
Matthews, J. W.
Phelps, Nancy
DEXTER
Washburn, E. R.
FENTON
Lyons, D. F.
Sexton, J. W.
FLINT
Gold, Mary E. S.
Parmelee, L. S.
Wade, C. J.
GAYLORD
Curtis, G. H.
GRAND RAPIDS
Davis, J. B.
Hulst, Corenlia S.
Jennings, Albert
Stearns, Frances L.
HASTINGS
Allison, Clara J.
HOLLAND
Bishop, W. R. T.
HOWELL
Sharpe, E. Alma
HOPE COLLEGE
Brush, H. R.
JACKSON
Marsh, E. O.
KALAMAZOO
Gould, R. R. N.
Hartwell, S. O.
KALAMAZOO COL.
Praeger, W. E.
Williams, C. B.
LANSING
Atkins, Edith E.
Jamison, Clara O.
Pattengill, H. R.
Sloan, N. B.
Wilber, Etta
Wright, L. L.
MT. CLEMENS
Everett, J. P.
Forsythe, L. L.
MANCHESTER
Kirchhoffer, Marie
MARSHALL
Garwood, R. S.
MICH. AGRI. COL.
Ryder, E. H.
MICH. MIL. ACAD.
Hull, L. C.
MONROE
Dudley, S. M.
MUSKEGON
Frost, J. M.
NORMAL COLLEGE
Barbour, F. A.
Buell, Bertha G.
D'Ooge, B. L.
Ford, R. C.
Goddard, Mary A.
Harvey, N. A.

Jones, L. H.
Laird, S. B.
Lyman, E. A.
Magers, S. D.
Norris, O. O.
Peet, B. W.
Putnam, Mary B.
Roberts, D. H.
Stone, J. C.
Strong, E. A.

OAK PARK, ILL.
Lee, L. B.

OLIVET COLLEGE
Lancaster, E. G.
Smith, N. F.

OTSEGO
Longman, M. W.

PORT HURON
Crane, Mrs. S. A.
Easton, A. J.
Fyan, Lila E.
Lewis, W. F.

PLYMOUTH
Isbell, W. N.

SAGINAW
Bricker, J. I.
Cook, Webster
Parrott, L. M.
Warner, W. W.
Warriner, E. C.
Whitney, W. L.

ST. LOUIS
DeWitt, A. D.

SEATTLE, WASH.
Maul, E. G.

TECUMSEH
Hartbeck, Flora

UNIVERSITY
Angell, James B.
Beman, W. W.
Bradshaw, J. W.
Canfield, A. G.
Carhart, H. S.
Cross, A. L.
Denison, Walter
Diekhoff, Tobias
Dow, E. W.
Finney, B. A.
Karpinski, L. C.
Kelsey, F. W.
Hudson, Richard
Markley, J. L.
Morrill, C. B.
Newcombe, F. C.
Patterson, George W.
Whitney, A. S.
Winkler, Max
Ziwet, Alex.

WESTERN NORMAL
Burnham ,Ernest
Waldo, D. B.

YPSILANTI
Arbaugh, W. B.
Ross, DeForest

LIST OF MEMBERS FOR 1908

ADRIAN
Curtis, A. E.

ALBION
Sanborn, Nannie

ALBION COLLEGE
Demorest, F. C.
Goodrich, F. S.
Green, C. W.
Pitkin, W. R.

ALLEGAN
Gage, Nina M.

ALMA
Ellisworth, F. E.

ALMA COLLEGE
Meyer, H. J.

ANN ARBOR
Breed, Gertrude
Chute, H. N.
Essery, E. E.
Hawkes, W. H.
Jocelyn, L. P.
Langley, Anna
Marsh, F. B.
Moran, F. A.
Montgomery, Jabez
Purtell, Catherine
Porter, Alice
Slauson, H. M.
Springer, D. W.
Sturgis, Martha
Travis, Ora
True, Myra B.
Whedon, Sara
Wines, L. D.
Yeo, C. K.

BATTLE CREEK
Benson, W.
Coburn, W. G.
Hickey, T. P.
Phillip, W. B.

BAY CITY
Ackerman, Emma C.
Ballou, Isabelle
Gates, E. L.
Hunker, Emma G.
Scott, E. L.
Sharpe, E. M.
Stewart, J. A.
Swain, G. R.
Taylor, Harriet L.

BENTON HARBOR
Farmer, Sarah L.
Wright, W. R.

BIG RAPIDS
Green, Loa
White, J. A.

BROOKLYN
McAlpine, D. C.

BUCHANAN
Abell, E. L.

CADILLAC
Gemberling, J. B.

CARO
Fell, E. E.

CASS CITY
Tiegden, F. A.
Tiegden, Mrs. F. A.

CASSOPOLIS
Brown, J. W. C.

CENTRAL NORMAL
Barnard, Anna M.
Larzelere, C. S.

CHARLOTTE
Carrick, C. H.

CHEBOYGAN
Wood, A. F.

CHELSEA
Gallup, E. E.

CHARLEVOIX
Lombard, Anna

CHICAGO, ILL.
Bacon, P. V.
Boyer, C. J.
Halsey, L. R.
Lobaugh, E. D.
Miner, R. S.
Nutt, H. D.

CLEARY'S BUS. COL.
Cleary, P. R.

CLEVELAND, O.
Beman, Edith I.

COLDWATER
Homann, C. J.
McElroy, E. M.

CROSSWELL
Tice, J. M.

DECATUR
Mahoney, Anna
Willison, Mabel C.

DETROIT
Arbury, F. W.
Bennett, R. J.
Campbell, Erwin
Courtis, S. A.
Ferris, L.
Highley, A. M.
Martindale, W. C.
Schaeberle, Fred'k
DETROIT CENTRAL
Adams, C. F.
Ashleman, L. A.
Bartlett, A. E.
Bates, F. O.
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